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AN INVESTIGATION
OF A REMEDIAL ARITHMETIC PROGRAM
IN EIGHT GRADE EIGHT CLASSES
IN THE EDMONTON PUBLIC SCHOOL SYSTEM

by

EDDIE BERTRAM LINDBERG

EDMONTON, Alta.

October, 1957.

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UNIVERSITY OF ALBERTA

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A thesis submitted to
The Committee on Graduate Studies
of the University of Alberta
in partial fulfilment of the
requirements for the degree of

MASTER OF EDUCATION

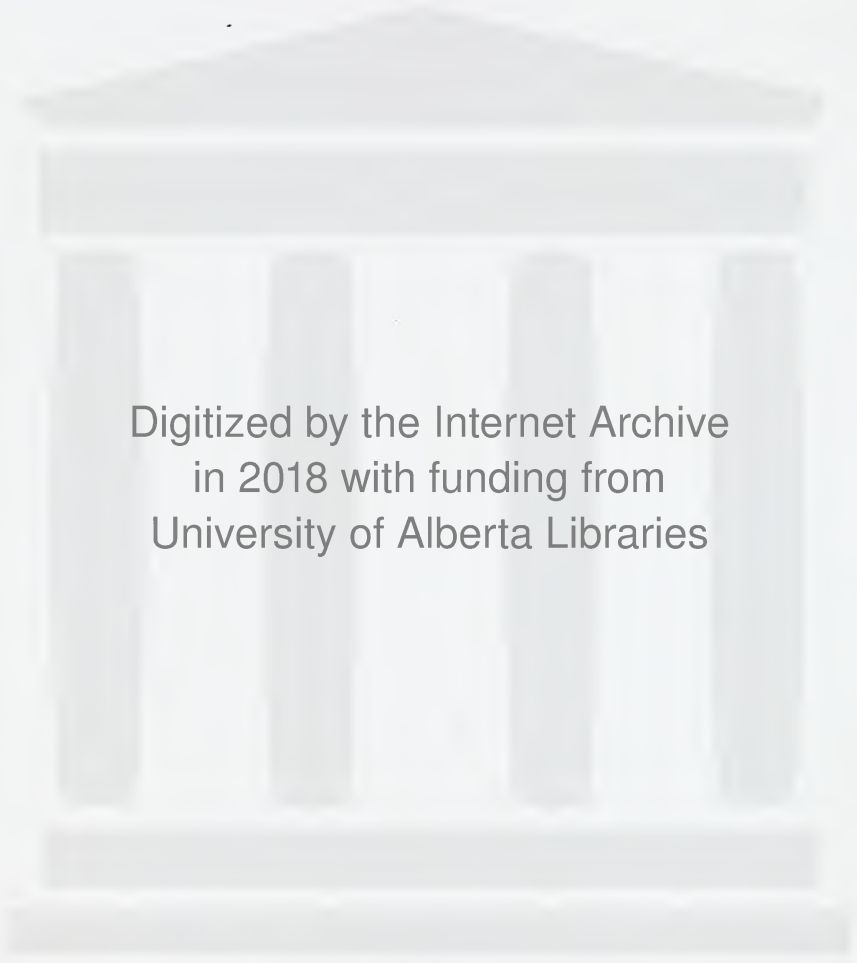
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by

Eddie Bertram Lindberg

Edmonton Alberta

B.Ed. University of Alberta 1953



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APPENDIX

1. The following are the names of the persons who have been
admitted to the school, and to all of them, the school
authorities are bound to give the same rights and
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CHAPTER I

THE PROBLEM AND ITS SETTING

In setting up this study, it is taken for granted that facility in the fundamental skills of arithmetic is necessary in our society, and that as educators, we should aim to help our students attain as high a level of achievement as they are capable of in this area. It is generally recognized that although many pupils are achieving up to their level, and some are over-achieving, there are those who are not getting the results of which they are capable. In an attempt to assist the groups who are not achieving to the limits of their ability, the following investigation was made in the city of Edmonton. It is hoped that this thesis will be of help in the setting up of similar research projects which may eventually yield answers to this teaching problem.

In dealing with remedial teaching of arithmetic, the Encyclopedia of Educational Research states that up to date (1950), research had not advanced to the point where questions concerning relative merit of procedures could be answered with assurance. The editor summarizes: (a) there is a sizable problem; over fifty per cent in upper grades and high school suffer (b) most common sources of error can

easily be found (c) numerous programs have been successful (d) selected individuals with normal or above normal I.Q.'s can be brought up to perfect scores on fundamental processes (e) perfect scores are difficult to maintain, so review will always be necessary.

Dr. Weaver¹ states that he found four published studies in relation to individual differences and diagnostic and remedial programs in the years 1951 to 1956. He says there have been all too few truly major and significant experimental research studies which deal directly with fundamental aspects of the learning process.

One of these is by Allen Bernstein² who, from a group of 523 students who were given the Cody diagnostic arithmetic test³, selected fifty-five students who needed special help. Teaching clinics were set up, wherein a maximum of six students were taught at a time. Wholly individual instruction was given. The project continued for two semesters, and the pupils attended for periods varying from one lesson to the whole semester. The mean

¹J. Fred Weaver, "Six Years of Research on Arithmetic Instruction", The Arithmetic Teacher, 4 (April 1957), 88-99.

²Allen Bernstein, "A Study of Remedial Arithmetic Conducted with Grade Nine Students", School Science and Mathematics, 56 (January 1956), 25-31 (June 1956) 429-437.

³Cody High School Diagnostic Test.

number of lessons attended was seventeen decimal two. Special exercises were prepared by the teacher, and work-books were used. These students were excused from regular mathematics classes to attend the clinics. The Cody Test was repeated at the end of the semester. A control group of forty-eight was taken from the General Mathematics group at the beginning of the next semester and given the same test. The result reported by Mr. Bernstein stated that the mean gain for the experimental group was thirteen decimal nine points while that for the control group was one decimal two points.

Jean Hamilton⁴ estimates that eighty per cent of the children in need of remedial instruction in our regular classroom are of normal or above normal intelligence, which percentage remains about the same as it was fifty years ago. She warned that care should be taken that no stigma be attached to a child in a remedial class. She also pointed out that research in the field of individual differences indicates weaknesses in homogeneous grouping. She stated that teachers must know what children need to know about arithmetic, and how children learn, so that they can build up the pupils' background. A balance must be

⁴Jean F. Hamilton, "Remedial Arithmetic in the Regular Classroom", School Science and Mathematics, 56 (March 1956), 197-209.

maintained between the use of concrete objects and abstract things; either can be overdone. A pointed quotation is also made regarding learning through experience:

We forget that one of the most worthwhile experiences children can have is to think, and this can often be done best in a quiet and relaxed classroom.

Lesta Hoel⁵ reminds us that we can no longer merely treat symptoms in remedial work, but we must look for the cause and take measures to bring about a permanent cure. A long-term program must be developed where we deal with present symptoms but where we also carry on a prevention program. She says that in the last analysis, corrective or remedial teaching is merely correct teaching. Heavy class loads characteristic of classrooms of today make teaching more difficult but we can do better.

Alice Hach⁶ suggests three things to do to increase the effectiveness of our mathematics program in junior high:

- (1) Each teacher needs to know the emotional climate in a classroom which will result in the most effective learning.
- (2) He must know the techniques that help build this

⁵Lesta Hoel, "What Constitutes Remedial Work in Arithmetic", Mathematics Teacher, 43 (January 1950), 19-24.

⁶Alice Hach, "Removing the 'Dis' from Dislike for Mathematics", Mathematics Teacher, 50 (January 1957), 65-69.

maintained between the end of each section and the next

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emotional climate so that children may gain new insight in the study of mathematics and develop a liking, an appreciation and a curiosity for the subject.

(3) The eighth grade is in an unpredictable age.

We need enough of the elementary approach to stabilize the group, but enough of the secondary approach to challenge and hold the interest of the group.

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CHAPTER II

THE RESEARCH DESIGN

Teachers and principals representing six junior high schools in Edmonton⁷ showed special interest in a remedial arithmetic program in grade eight. Arrangements were made through the administrative staff of the Edmonton Public School Board to introduce such a course experimentally for the school year 1956 to 1957. They asked that the classes concerned be of the standard size of thirty to thirty-five pupils so that no additional teachers would be required. Permission was granted to reduce the number of periods set aside for the exploratory subjects to the minimum required by the provincial Department of Education, in order to get class time for the course. They also desired that a remedial reading program be carried on in conjunction with the one in arithmetic.

Principals stated that because of timetable difficulties it would be easier if remedial classes were made up as units that would remain together for all subjects, including the regular mathematics.

The six schools had a total of approximately 800

⁷Garneau, H.A. Gray, McCauley, Ritchie, Strathearn and Westmount.

CHAPTER II

THE ECONOMIC SITUATION

For several years the principal concern of the Government

has been to develop the economic situation in the country. In the early years of the Republic, the Government was faced with the problem of how to develop the country's resources. It was necessary to attract foreign capital and to encourage the growth of the private enterprise system. The Government has been successful in these efforts, and the country has made great progress in the development of its economy.

One of the main reasons for the success of the Government's economic policy has been the fact that it has been able to attract foreign capital. This has been done by offering favorable conditions to foreign investors, and by providing them with the necessary legal and administrative support. The Government has also been able to encourage the growth of the private enterprise system, which has been a major factor in the development of the country's economy.

In addition to the fact that it has been able to attract foreign capital, the Government has also been able to encourage the growth of the private enterprise system. This has been done by providing the necessary legal and administrative support, and by offering favorable conditions to private investors. The Government has also been able to encourage the growth of the public enterprise system, which has been a major factor in the development of the country's economy.

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THE ECONOMIC SITUATION IN THE COUNTRY
AND THE GOVERNMENT'S POLICY

pupils in twenty-six grade eight classes. From these, 225 pupils were selected for eight remedial forms. Since they had to be organized at the beginning of the term, they were made up, except at Garneau, from those pupils who had shown below-average achievement in the school year preceding.

Garneau included in their two remedial classes, pupils who rated lower than grade eight decimal one standing on the Stanford Advanced Arithmetic Test in Computation, Form J⁸ when it was given in October. These students were brought together only for the special lessons and then returned to their original groups for other subjects. They attended the regular mathematics courses as well. The balance of the grade eight scholars had study periods in other classrooms while the remedial class was in session.

During the first week in October, Stanford's Form J was administered to all the twenty-six classes in the six schools. This test was also given at that time to seven grade eight forms from two other city junior high schools⁹ which were not operating such extra lessons.

⁸Stanford Achievement Tests, World Book Co., Yonkers-on-Hudson, N.Y.

⁹Allendale and Eastwood.

The object was to use their results for control purposes. For the next eight weeks, sixteen to twenty half-hour periods were set aside for remedial arithmetic in each of the six schools.

Special exercises with answer keys, instructions and suggestions regarding methods and procedure were sent out to each of the teachers in charge of remedial classes.¹⁰ Within the limits of administrative requirements and local conditions, teachers were however, left free to handle the course in whatever way they saw fit. An attempt was thus made to have the project fit into the regular curriculum on a normal basis, the idea being to see to what extent a remedial program could be made effective under such conditions.

At the end of the eight weeks of instruction, a recess of similar length occurred while similar classes in reading were held.

The third eight-week period saw the remedial arithmetic program continue. When sixteen to twenty more lessons had been given, the program ended and a forgetting period of approximately three weeks was allowed. During the first week of May, Form K of Stanford's Achievement Test in Computation was given to all the grade eight pupils in the

¹⁰See appendix B.

thirty-three classes of the eight co-operating schools. Each teacher in charge of a special class also answered a questionnaire regarding the program.¹¹

When all the tests and other data had been gathered, comparisons were made. Since the Edmonton Public Schools obtain Laycock I.Q. scores for its pupils, comparative I.Q. ratings were available from the cumulative record folders. The main comparison was made between sixty-one paired groups, equated on the basis of I.Q. standings and on the Form J test. One group of sixty-one was obtained from the 225 students in remedial classes and the other group of sixty-one was taken from the 740 pupils who were not in the extra course. The range of I.Q.'s in the matched couples varied from eighty-two to 125, and the range of achievement on Form J (forty-four questions) was from eighteen to thirty-four. These sixty-one pairs were then compared according to their results on Form K of the Stanford Test.

¹¹See appendix B.

Twenty-three of the fifty-one members of the

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CHAPTER III

PRESENTATION AND INTERPRETATION OF DATA

Overall results of the statistical findings arrived at from the administration of Forms J and K of Stanford's Arithmetic tests in Computation in October 1956 and May 1957 respectively are summarized in Tables 1 and 2 shown on the following pages.

The forty-four items on each of these tests cover adequately the fundamentals in arithmetic computation. The two forms are well-balanced in the types of calculations asked for. Although the testing time for both is set for thirty-five minutes (and said by Stanford to be ample), the time allowed the Edmonton classes was thirty-three minutes because of the length of the class periods. No pupil got all correct on Form K; three scored forty-three, while the lowest mark was nine.

Table 1 is an analysis of the pupils in the schools tested, in respect to their Laycock I.Q.'s. The scholars in the special classes rated slightly lower on the average than the ones in the regular program did. There was a range of I.Q. from seventy-two to 148 in the remedial group, and from seventy-six to 149 amongst those who did not have to take extra tuition. Although most of the students had been

classified according to their achievement during the preceding year, the difference between the two sections according to their I.Q. range seemed to be insignificant.

Table 2 summarizes mean scores earned by the pupils of the eight schools where Forms J and K were administered. The Stanford mean grade equivalent on Form J for October would be eight decimal one, while the grade equivalent on Form K for May would be eight decimal eight. On Form J the total population in this investigation had a standing of eight decimal one. The remedial pupils stood at seven decimal five, while the non-remedial students averaged eight decimal two. On Form K, the total population had a mean of eight decimal seven, the remedial scholars eight decimal two, and those not taking the course attained nine grade equivalent.

According to these statistics, the special pupils achieved at a level six months behind the Stanford Form J average, but improved by seven months according to Form K means after the seven month interval.

The balance of the population was one month ahead of the Stanford mean and improved eight months in the same period. The total group equalled Stanford's J average in October, but improved only six months in grade equivalent by May. Thus they were one month behind the norm reported by the test makers.

classified according to their position during the war.
The difference between the two sections was
considered to be small.

Table 2 shows the results of the

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significantly different.

TABLE 1.--SUMMARY OF LAYCOCK I.Q. STATISTICS FOR REMEDIAL AND
NON-REMEDIAL CLASSES IN THIRTY-THREE EDMONTON CLASSROOMS

School	Laycock Mean I.Q.	Pupils in Remedial Classes		Pupils Not in Remedial Classes	
		Mean I.Q.	I.Q. Range	Mean I.Q.	I.Q. Range
1	103.9	95.3	80 to 111	105.6	80 to 147
2	112.7	110.1	80 to 148	116.5	95 to 144
3	105.4	(no remedial classes)	(no remedial classes)	105.4	82 to 133
4	104.3	(no remedial classes)	(no remedial classes)	104.3	79 to 134
5	105.5	93.6	74 to 110	108.6	82 to 138
6	103.1	92.3	79 to 109	105.5	76 to 139
7	105.8	98.0	80 to 130	108.4	81 to 149
8	105.6	99.4	72 to 129	108.3	79 to 139

THE FOLLOWING IS A SUMMARY OF THE RESULTS OF THE ANALYSIS OF THE SAMPLES OF THE ABOVE-mentioned material.

ANALYSIS OF SAMPLES OF THE ABOVE-mentioned material.				Total	
Sample No.	Weight of Sample (gms.)	Weight of Residue (gms.)	Weight of Loss (gms.)	Weight of Residue (gms.)	Weight of Loss (gms.)
1	1.000	0.800	0.200	0.800	0.200
2	1.000	0.750	0.250	0.750	0.250
3	1.000	0.700	0.300	0.700	0.300
4	1.000	0.650	0.350	0.650	0.350
5	1.000	0.600	0.400	0.600	0.400
6	1.000	0.550	0.450	0.550	0.450
7	1.000	0.500	0.500	0.500	0.500
8	1.000	0.450	0.550	0.450	0.550
9	1.000	0.400	0.600	0.400	0.600
10	1.000	0.350	0.650	0.350	0.650

TABLE 2.--SUMMARY OF STATISTICS OBTAINED FROM ADMINISTRATION OF FORMS J AND K
STANFORD ADVANCED ARITHMETIC TESTS IN COMPUTATION TO GRADE EIGHT
STUDENTS IN THIRTY-THREE EDMONTON CLASSROOMS IN OCTOBER 1956 AND
MAY 1957 RESPECTIVELY

School	Mean Score on Form J			Mean Score on Form K		
	Remedial Group	Non-Remedial Group	All	Remedial Group	Non-Remedial Group	All
1	23.27	28.24	27.31	28.44	32.13	31.54
2	26.49	34.47	28.96	33.93	36.28	34.69
3	(No remedial classes)		30.67	-	-	34.02
4	(No remedial classes)		27.09	-	-	30.71
5	26.14	30.52	29.64	23.53	33.65	31.44
6	23.71	27.81	26.88	26.84	32.75	31.58
7	23.22	29.09	27.71	27.65	34.23	32.59
8	26.76	30.29	29.16	33.03	33.51	33.37
Mean Score	25.50	29.42	28.51	30.41	33.16	32.52
Grade Equivalent	7.5	8.2	8.1	8.2	9.0	8.7
Number Tested	227	741	968	224	736	960

1. The following information was obtained from the records of the
 2. Bureau of the Census, Washington, D. C., for the year 1960.
 3. The information was obtained from the records of the
 4. Bureau of the Census, Washington, D. C., for the year 1960.
 5. The information was obtained from the records of the
 6. Bureau of the Census, Washington, D. C., for the year 1960.

1960-61 School Year		1961-62 School Year		1962-63 School Year		1963-64 School Year		1964-65 School Year		1965-66 School Year		1966-67 School Year		1967-68 School Year		1968-69 School Year		1969-70 School Year		1970-71 School Year		1971-72 School Year		1972-73 School Year		1973-74 School Year		1974-75 School Year		1975-76 School Year		1976-77 School Year		1977-78 School Year		1978-79 School Year		1979-80 School Year		1980-81 School Year		1981-82 School Year		1982-83 School Year		1983-84 School Year		1984-85 School Year		1985-86 School Year		1986-87 School Year		1987-88 School Year		1988-89 School Year		1989-90 School Year		1990-91 School Year		1991-92 School Year		1992-93 School Year		1993-94 School Year		1994-95 School Year		1995-96 School Year		1996-97 School Year		1997-98 School Year		1998-99 School Year		1999-00 School Year		2000-01 School Year		2001-02 School Year		2002-03 School Year		2003-04 School Year		2004-05 School Year		2005-06 School Year		2006-07 School Year		2007-08 School Year		2008-09 School Year		2009-10 School Year		2010-11 School Year		2011-12 School Year		2012-13 School Year		2013-14 School Year		2014-15 School Year		2015-16 School Year		2016-17 School Year		2017-18 School Year		2018-19 School Year		2019-20 School Year		2020-21 School Year		2021-22 School Year		2022-23 School Year		2023-24 School Year		2024-25 School Year		2025-26 School Year		2026-27 School Year		2027-28 School Year		2028-29 School Year		2029-30 School Year		2030-31 School Year		2031-32 School Year		2032-33 School Year		2033-34 School Year		2034-35 School Year		2035-36 School Year		2036-37 School Year		2037-38 School Year		2038-39 School Year		2039-40 School Year		2040-41 School Year		2041-42 School Year		2042-43 School Year		2043-44 School Year		2044-45 School Year		2045-46 School Year		2046-47 School Year		2047-48 School Year		2048-49 School Year		2049-50 School Year		2050-51 School Year		2051-52 School Year		2052-53 School Year		2053-54 School Year		2054-55 School Year		2055-56 School Year		2056-57 School Year		2057-58 School Year		2058-59 School Year		2059-60 School Year		2060-61 School Year		2061-62 School Year		2062-63 School Year		2063-64 School Year		2064-65 School Year		2065-66 School Year		2066-67 School Year		2067-68 School Year		2068-69 School Year		2069-70 School Year		2070-71 School Year		2071-72 School Year		2072-73 School Year		2073-74 School Year		2074-75 School Year		2075-76 School Year		2076-77 School Year		2077-78 School Year		2078-79 School Year		2079-80 School Year		2080-81 School Year		2081-82 School Year		2082-83 School Year		2083-84 School Year		2084-85 School Year		2085-86 School Year		2086-87 School Year		2087-88 School Year		2088-89 School Year		2089-90 School Year		2090-91 School Year		2091-92 School Year		2092-93 School Year		2093-94 School Year		2094-95 School Year		2095-96 School Year		2096-97 School Year		2097-98 School Year		2098-99 School Year		2099-00 School Year		2100-01 School Year		2101-02 School Year		2102-03 School Year		2103-04 School Year		2104-05 School Year		2105-06 School Year		2106-07 School Year		2107-08 School Year		2108-09 School Year		2109-10 School Year		2110-11 School Year		2111-12 School Year		2112-13 School Year		2113-14 School Year		2114-15 School Year		2115-16 School Year		2116-17 School Year		2117-18 School Year		2118-19 School Year		2119-20 School Year		2120-21 School Year		2121-22 School Year		2122-23 School Year		2123-24 School Year		2124-25 School Year		2125-26 School Year		2126-27 School Year		2127-28 School Year		2128-29 School Year		2129-30 School Year		2130-31 School Year		2131-32 School Year		2132-33 School Year		2133-34 School Year		2134-35 School Year		2135-36 School Year		2136-37 School Year		2137-38 School Year		2138-39 School Year		2139-40 School Year		2140-41 School Year		2141-42 School Year		2142-43 School Year		2143-44 School Year		2144-45 School Year		2145-46 School Year		2146-47 School Year		2147-48 School Year		2148-49 School Year		2149-50 School Year		2150-51 School Year		2151-52 School Year		2152-53 School Year		2153-54 School Year		2154-55 School Year		2155-56 School Year		2156-57 School Year		2157-58 School Year		2158-59 School Year		2159-60 School Year		2160-61 School Year		2161-62 School Year		2162-63 School Year		2163-64 School Year		2164-65 School Year		2165-66 School Year		2166-67 School Year		2167-68 School Year		2168-69 School Year		2169-70 School Year		2170-71 School Year		2171-72 School Year		2172-73 School Year		2173-74 School Year		2174-75 School Year		2175-76 School Year		2176-77 School Year		2177-78 School Year		2178-79 School Year		2179-80 School Year		2180-81 School Year		2181-82 School Year		2182-83 School Year		2183-84 School Year		2184-85 School Year		2185-86 School Year		2186-87 School Year		2187-88 School Year		2188-89 School Year		2189-90 School Year		2190-91 School Year		2191-92 School Year		2192-93 School Year		2193-94 School Year		2194-95 School Year		2195-96 School Year		2196-97 School Year		2197-98 School Year		2198-99 School Year		2199-00 School Year		2200-01 School Year		2201-02 School Year		2202-03 School Year		2203-04 School Year		2204-05 School Year		2205-06 School Year		2206-07 School Year		2207-08 School Year		2208-09 School Year		2209-10 School Year		2210-11 School Year		2211-12 School Year		2212-13 School Year		2213-14 School Year		2214-15 School Year		2215-16 School Year		2216-17 School Year		2217-18 School Year		2218-19 School Year		2219-20 School Year		2220-21 School Year		2221-22 School Year		2222-23 School Year		2223-24 School Year		2224-25 School Year		2225-26 School Year		2226-27 School Year		2227-28 School Year		2228-29 School Year		2229-30 School Year		2230-31 School Year		2231-32 School Year		2232-33 School Year		2233-34 School Year		2234-35 School Year		2235-36 School Year		2236-37 School Year		2237-38 School Year		2238-39 School Year		2239-40 School Year		2240-41 School Year		2241-42 School Year		2242-43 School Year		2243-44 School Year		2244-45 School Year		2245-46 School Year		2246-47 School Year		2247-48 School Year		2248-49 School Year		2249-50 School Year		2250-51 School Year		2251-52 School Year		2252-53 School Year		2253-54 School Year		2254-55 School Year		2255-56 School Year		2256-57 School Year		2257-58 School Year		2258-59 School Year		2259-60 School Year		2260-61 School Year		2261-62 School Year		2262-63 School Year		2263-64 School Year		2264-65 School Year		2265-66 School Year		2266-67 School Year		2267-68 School Year		2268-69 School Year		2269-70 School Year		2270-71 School Year		2271-72 School Year		2272-73 School Year		2273-74 School Year		2274-75 School Year		2275-76 School Year		2276-77 School Year		2277-78 School Year		2278-79 School Year		2279-80 School Year		2280-81 School Year		2281-82 School Year		2282-83 School Year		2283-84 School Year		2284-85 School Year		2285-86 School Year		2286-87 School Year		2287-88 School Year		2288-89 School Year		2289-90 School Year		2290-91 School Year		2291-92 School Year		2292-93 School Year		2293-94 School Year		2294-95 School Year		2295-96 School Year		2296-97 School Year		2297-98 School Year		2298-99 School Year		2299-00 School Year		2300-01 School Year		2301-02 School Year		2302-03 School Year		2303-04 School Year		2304-05 School Year		2305-06 School Year		2306-07 School Year		2307-08 School Year		2308-09 School Year		2309-10 School Year		2310-11 School Year		2311-12 School Year		2312-13 School Year		2313-14 School Year		2314-15 School Year		2315-16 School Year		2316-17 School Year		2317-18 School Year		2318-19 School Year		2319-20 School Year		2320-21 School Year		2321-22 School Year		2322-23 School Year		2323-24 School Year		2324-25 School Year		2325-26 School Year		2326-27 School Year		2327-28 School Year		2328-29 School Year		2329-30 School Year		2330-31 School Year		2331-32 School Year		2332-33 School Year		2333-34 School Year		2334-35 School Year		2335-36 School Year		2336-37 School Year		2337-38 School Year		2338-39 School Year		2339-40 School Year		2340-41 School Year		2341-42 School Year		2342-43 School Year		2343-44 School Year		2344-45 School Year		2345-46 School Year		2346-47 School Year		2347-48 School Year		2348-49 School Year		2349-50 School Year		2350-51 School Year		2351-52 School Year		2352-53 School Year		2353-54 School Year		2354-55 School Year		2355-56 School Year		2356-57 School Year		2357-58 School Year		2358-59 School Year		2359-60 School Year		2360-61 School Year		2361-62 School Year		2362-63 School Year		2363-64 School Year		2364-65 School Year		2365-66 School Year		2366-67 School Year		2367-68 School Year		2368-69 School Year		2369-70 School Year		2370-71 School Year		2371-72 School Year		2372-73 School Year		2373-74 School Year		2374-75 School Year		2375-76 School Year		2376-77 School Year		2377-78 School Year		2378-79 School Year		2379-80 School Year		2380-81 School Year		2381-82 School Year		2382-83 School Year		2383-84 School Year		2384-85 School Year		2385-86 School Year		2386-87 School Year		2387-88 School Year		2388-89 School Year		2389-90 School Year		2390-91 School Year		2391-92 School Year		2392-93 School Year		2393-94 School Year		2394-95 School Year		2395-96 School Year		2396-97 School Year		2397-98 School Year		2398-99 School Year		2399-00 School Year		2400-01 School Year		2401-02 School Year		2402-03 School Year		2403-04 School Year		2404-05 School Year		2405-06 School Year		2406-07 School Year		2407-08 School Year		2408-09 School Year		2409-10 School Year		2410-11 School Year		2411-12 School Year		2412-13 School Year		2413-14 School Year		2414-15 School Year		2415-16 School Year		2416-17 School Year		2417-18 School Year		2418-19 School Year		2419-20 School Year		2420-21 School Year		2421-22 School Year		2422-23 School Year		2423-24 School Year		2424-25 School Year		2425-26 School Year		2426-27 School Year		2427-28 School Year		2428-29 School Year		2429-30 School Year		2430-31 School Year		2431-32 School Year		2432-33 School Year		2433-34 School Year		2434-35 School Year		2435-36 School Year		2436-37 School Year		2437-38 School Year		2438-39 School Year		2439-40 School Year		2440-41 School Year		2441-42 School Year		2442-43 School Year		2443-44 School Year		2444-45 School Year		2445-46 School Year		2446-47 School Year		2447-48 School Year		2448-49 School Year		2449-50 School Year		2450-51 School Year		2451-52 School Year		2452-53 School Year		2453-54 School Year		2454-55 School Year		2455-56 School Year		2456-57 School Year		2457-58 School Year		2458-59 School Year		2459-60 School Year		2460-61 School Year		2461-62 School Year		2462-63 School Year		2463-64 School Year		2464-65 School Year		2465-66 School Year		2466-67 School Year		2467-68 School Year		2468-69 School Year		2469-70 School Year		2470-71 School Year		2471-72 School Year		2472-73 School Year		2473-74 School Year		2474-75 School Year		2475-76 School Year		2476-77 School Year		2477-78 School Year		2478-79 School Year		2479-80 School Year		2480-81 School Year		2481-82 School Year		2482-83 School Year		2483-84 School Year		2484-85 School Year		2485-86 School Year		2486-87 School Year		2487-88 School Year		2488-89 School Year		2489-90 School Year		2490-91 School Year		2491-92 School Year		2492-93 School Year		2493-94 School Year		2494-95 School Year		2495-96 School Year		2496-97 School Year		2497-98 School Year		2498-99 School Year		2499-00 School Year		2500-01 School Year		2501-02 School Year		2502-03 School Year		2503-04 School Year		2504-05 School Year		2505-06 School Year		2506-07 School Year		2507-08 School Year		2508-09 School Year		2509-10 School Year		2510-11 School Year		2511-12 School Year		2512-13 School Year		2513-14 School Year		2514-15 School Year		2515-16 School Year		2516-17 School Year		2517-18 School Year		2518-19 School Year		2519-20 School Year		2520-21 School Year		2521-22 School Year		2522-23 School Year		2523-24 School Year		2524-25 School Year		2525-26 School Year		2526-27 School Year		2527-28 School Year		2528-29 School Year		2529-30 School Year		2530-31 School Year		2531-32 School Year		2532-33 School Year		2533-34 School Year		2534-35 School Year		2535-36 School Year		2536-37 School Year		2537-38 School Year		2538-39 School Year		2539-40 School Year		2540-41 School Year		2541-42 School Year		2542-43 School Year		2543-44 School Year		2544-45 School Year		2545-46 School Year		2546-47 School Year		2547-48 School Year		2548-49 School Year		2549-50 School Year		2550-51 School Year		2551-52 School Year		2552-53 School Year		2553-54 School Year		2554-55 School Year		2555-56 School Year		2556-57 School Year		2557-58 School Year		2558-59 School Year		2559-60 School Year		2560-61 School Year		2561-62 School Year		2562-63 School Year		2563-64 School Year		2564-65 School Year		2565-66 School Year		2566-67 School Year		2567-68 School Year		2568-69 School Year		2569-70 School Year		2570-71 School Year		2571-72 School Year		2572-73 School Year		2573-74 School Year		2574-75 School Year		2575-76 School Year		2576-77 School Year		2577-78 School Year		2578-79 School Year		2579-80 School Year		2580-81 School Year		2581-82 School Year		2582-83 School Year		2583-84 School Year		2584-85 School Year		2585-86 School Year		2586-87 School Year		2587-88 School Year		2588-89 School Year		2589-90 School Year		2590-91 School Year		2591-92 School Year		2592-93 School Year		2593-94 School Year		2594-95 School Year		2595-96 School Year		2596-97 School Year		2597-98 School Year		2598-99 School Year		2599-00 School Year		2600-01 School Year		2601-02 School Year		2602-03 School Year		2603-04 School Year		2604-05 School Year		2605-06 School Year		2606-07 School Year		2607-08 School Year		2608-09 School Year		2609-10 School Year		2610-11 School Year		2611-12 School Year		2612-13 School Year		2613-14 School Year		2614-15 School Year		2615-16 School Year		2616-17 School Year		2617-18 School Year		2618-19 School Year		2619-20 School Year		2620-21 School Year		2621-22 School Year		2622-23 School Year		2623-24 School Year		2624-25 School Year		2625-26 School Year		2626-27 School Year		2627-28 School Year		2628-29 School Year		2629-30 School Year		2630-31 School Year		2631-32 School Year		2632-33 School Year		2633-34 School Year		2634-35 School Year		2635-36 School Year		2636-37 School Year		2637-38 School Year		2638-39 School Year		2639-40 School Year		2640-41 School Year		2641-42 School Year		2642-43 School Year		2643-44 School Year		2644-45 School Year		2645-46 School Year		2646-47 School Year		2647-48 School Year		2648-49 School Year		2649-50 School Year		2650-51 School Year		2651-52 School Year		2652-53 School Year		2653-54 School Year		2654-55 School Year		2655-56 School Year		2656-57 School Year		2657-58 School Year		2658-59 School Year		2659-60 School Year		2660-61 School Year		2661-62 School Year		2662-63 School Year		2663-64 School Year		2664-65 School Year		2665-66 School Year		2666-67 School Year		2667-68 School Year		2668-69 School Year		2669-70 School Year		2670-71 School Year		2671-72 School Year		2672-73 School Year		2673-74 School Year		2674-75 School Year		2675-76 School Year		2676-77 School Year		2677-78 School Year		2678-79 School Year		2679-80 School Year		2680-81 School Year		2681-82 School Year		2682-83 School Year		2683-84 School Year		2684-85 School Year		2685-86 School Year		2686-87 School Year		2687-88 School Year	
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Table 3 shows the change in pupil achievement by schools and by totals on a score basis between Form J which was administered in October, and Form K which was given in May.

TABLE 3.--MEAN CHANGE IN PUPIL ACHIEVEMENT FROM FORM J TO FORM K

School	Mean Score of Remedial Group			Mean Score of Non-Remedial Group		
	Form J	Form K	Change	Form J	Form K	Change
1	23.27	28.44	+5.17	28.24	32.13	+3.89
2	26.49	33.93	+7.44	34.47	36.28	+1.81
3	-	-	-	30.67	34.02	+3.35
4	-	-	-	27.09	30.71	+3.62
5	26.14	23.53	-2.61	30.52	33.65	+3.13
6	23.71	26.84	+3.13	27.81	32.75	+4.94
7	23.22	27.65	+4.43	29.09	34.23	+5.14
8	26.76	33.03	6.27	30.29	33.51	+3.22
Mean	25.50	30.41	+4.91	29.42	33.16	+3.64
Grade Equivalent	7.5	8.2	+0.7	8.2	9.0	+0.8

Table 3 shows that although the remedial population improved its score by four decimal ninety-one while the others improved their score by three decimal sixty-four, the change in grade equivalent according to Stanford's

means were respectively decimal seven years and decimal eight years. This is explained by the fact that the non-remedial group made its improvement in the latter part of the test, which would reflect a higher relative change in grade equivalent.

The score of the remedial group in school two changed from twenty-six decimal forty-nine of Form J to thirty-three decimal ninety-three on Form K, which is equal to a grade equivalent change of seven decimal seven to nine decimal three or one decimal six years of improvement in decimal seven years. Similarly, school eight's special pupils improved from seven decimal seven to nine or one decimal three years. So these classes had altered from below average achievement on Stanford's J test to above average accomplishment on Form K. On the other hand, school five remedial group dropped from seven decimal six grade standing to seven or decimal six year's reversal in decimal seven years. Several factors such as negative attitude toward the course or the maladministration of a final test could have influenced the results.

Of the total school population, students in schools two, three, five, seven and eight reached or exceeded Stanford's October mean score on Form J (29). Schools two, three, five, six, seven and eight reached or exceeded Stanford's May mean score on Form K (32.5).

Table 4 analyzes for each school the change in grade equivalent after the seven-month period October eight to May eight, as measured by the Stanford J and K tests.

TABLE 4.--RELATIVE CHANGE IN GRADE EQUIVALENT,
BY SCHOOLS, AFTER SEVEN-MONTH PERIOD

School	Remedial Groups			Non-Remedial Groups		
	A*	B*	C*	A*	B*	C*
1	12	19	1	52	106	19
2	56	66	3	19	30	5
3	-	-	-	45	92	21
4	-	-	-	42	81	18
5	4	23	13	53	99	30
6	6	15	2	34	62	12
7	14	23	3	38	67	6
8	35	53	1	66	111	17
Totals	127	199	23	349	648	128
Per Cent Change	63.8		11.6	53.8		19.7

A* Number of students who improved more than decimal seven years.

B* Number of pupils in the group.

C* Number who made lower marks on terminal test K than on preliminary test J.

Table 4 compares the two methods in terms of accuracy and coverage. The results show that the proposed method outperforms the baseline in terms of both accuracy and coverage.

TABLE 4. COMPARISON OF THE PROPOSED METHOD AND THE BASELINE METHOD IN TERMS OF ACCURACY AND COVERAGE.

Method	Accuracy (%)			Coverage (%)		
	Proposed	Baseline	Random	Proposed	Baseline	Random
1	92.1	85.3	78.5	95.2	88.7	81.4
2	88.5	82.1	75.6	91.3	85.4	79.2
3	85.7	79.8	73.2	89.6	83.1	77.5
4	83.2	77.4	71.5	87.8	81.2	75.3
5	80.9	75.1	69.8	85.4	79.6	73.7
6	78.6	72.8	67.5	83.2	77.3	71.4
7	76.3	70.5	65.2	81.1	75.1	69.3
8	74.1	68.3	63.1	79.0	73.0	67.2
9	71.9	66.1	61.0	76.9	70.9	65.1
10	69.8	64.0	58.9	74.8	68.8	63.0
11	67.7	61.9	56.8	72.7	66.7	60.9
12	65.6	59.8	54.7	70.6	64.6	58.8
13	63.5	57.7	52.6	68.5	62.5	56.7
14	61.4	55.6	50.5	66.4	60.4	54.6
15	59.3	53.5	48.4	64.3	58.3	52.5
16	57.2	51.4	46.3	62.2	56.2	50.4
17	55.1	49.3	44.2	60.1	54.1	48.3
18	53.0	47.2	42.1	58.0	52.0	46.2
19	50.9	45.1	40.0	55.9	49.9	44.1
20	48.8	43.0	37.9	53.8	47.8	42.0

The results in Table 4 demonstrate that the proposed method consistently achieves higher accuracy and coverage than the baseline and random methods across all 20 test cases. The proposed method's performance is particularly notable in cases 1 through 10, where it maintains high accuracy and coverage even as the complexity of the task increases.

Table 4 shows that sixty-three decimal eight per cent of the special-class pupils improved more than decimal seven years in achievement according to Stanford's means, while fifty-three decimal eight per cent of the non-remedial students improved more than decimal seven years in that period.

Almost twelve per cent of the remedial pupils, however, got poorer results on Form K than they had obtained on Form J. Nearly twenty per cent of the non-remedial group got a lower standing on Form K than on Form J. Over twenty-four per cent of these getting special help, and twenty-six decimal five per cent of those who did not attend extra classes made average progress of decimal seven years.

Table 5 classifies the boys and the girls into six groups according to I.Q.'s in order to indicate whether one sex or any I.Q. group profited more by the extra sessions.

Table 1 shows that the first group of subjects, who were given a 10-minute rest period before the test, showed a significantly higher level of performance than the second group, who were given a 5-minute rest period. This result is consistent with the findings of other studies, which have shown that a longer rest period leads to better performance on a variety of tasks.

Table 2 shows that the first group of subjects, who were given a 10-minute rest period before the test, showed a significantly higher level of performance than the second group, who were given a 5-minute rest period. This result is consistent with the findings of other studies, which have shown that a longer rest period leads to better performance on a variety of tasks.

Table 3 shows that the first group of subjects, who were given a 10-minute rest period before the test, showed a significantly higher level of performance than the second group, who were given a 5-minute rest period. This result is consistent with the findings of other studies, which have shown that a longer rest period leads to better performance on a variety of tasks.

TABLE 5.--MEAN GRADE EQUIVALENT CHANGE BY BOYS
AND BY GIRLS, USING I.Q. RANGES AS
THE BASIS OF DISCRIMINATION

Remedial Group					Non-Remedial Group			
No. Pupils	I.Q. Range	Mean Grade Equivalent Change			No. Pupils	Mean Grade Equivalent Change		
		Boys	Girls	All		Boys	Girls	All
15	to 85	.53	.25	.46	23	.43	.38	.41
52	86 to 95	.50	.65	.58	96	.87	.59	.74
52	96 to 105	1.16	.99	1.08	148	.72	.82	.77
42	106 to 115	1.45	1.13	1.26	181	.94	1.10	1.03
19	116 to 125	2.26	2.03	2.12	113	.96	.98	.97
8	126 and up	2.40	1.90	2.34	53	.92	1.18	1.05

Table 5 does not seem to show any appreciable difference in improvement between boys and girls, but does seem to indicate that increasing benefit occurred with increasing I.Q.

The comparisons so far seem to indicate that the remedial program as carried out in the six schools was profitable. To test this assumption further, equated pairs were set up from amongst the 224 remedial and the 736 non-remedial students who had taken both tests. Sixty-one pairs were obtained, each pair being equated exactly on the basis of I.Q. and achievement on Stanford Form J. The I.Q.'s

1. The following information was obtained from the records of the
 2. Bureau of Census, Washington, D.C., on the subject of the
 3. above-named individual.

Personal History				Social History			
Date of Birth		Place of Birth		Date of Arrival in U.S.		Place of Arrival	
1911	10/10	1911	10/10	1911	10/10	1911	10/10
1912	10/10	1912	10/10	1912	10/10	1912	10/10
1913	10/10	1913	10/10	1913	10/10	1913	10/10
1914	10/10	1914	10/10	1914	10/10	1914	10/10
1915	10/10	1915	10/10	1915	10/10	1915	10/10
1916	10/10	1916	10/10	1916	10/10	1916	10/10
1917	10/10	1917	10/10	1917	10/10	1917	10/10
1918	10/10	1918	10/10	1918	10/10	1918	10/10
1919	10/10	1919	10/10	1919	10/10	1919	10/10
1920	10/10	1920	10/10	1920	10/10	1920	10/10

1. The following information was obtained from the records of the
 2. Bureau of Census, Washington, D.C., on the subject of the
 3. above-named individual.

4. The following information was obtained from the records of the
 5. Bureau of Census, Washington, D.C., on the subject of the
 6. above-named individual.

7. The following information was obtained from the records of the
 8. Bureau of Census, Washington, D.C., on the subject of the
 9. above-named individual.

10. The following information was obtained from the records of the
 11. Bureau of Census, Washington, D.C., on the subject of the
 12. above-named individual.

varied from eighty-two to 125. Table 6 compares the attainment of the equivalent groups on Forms J and K.

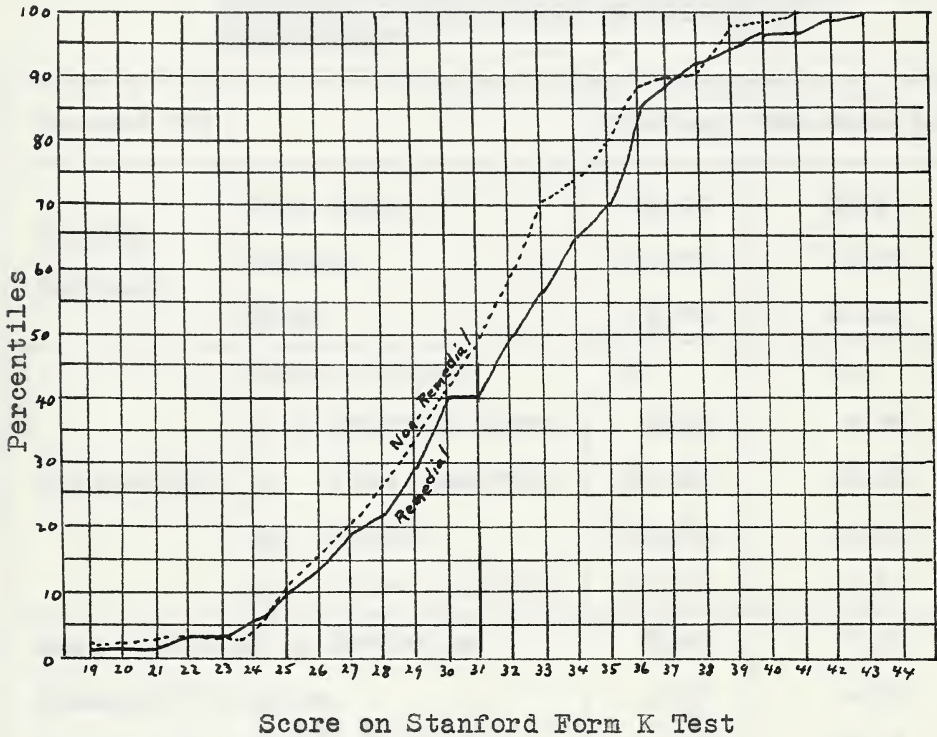
TABLE 6.--COMPARISON OF SCORES OF EQUATED GROUPS
ON FORMS J AND K

	Remedial	Non-Remedial
Number in each group	61	61
Mean score on Form J (initial)	27.65	27.65
Standard deviation on Form J	3.95	3.95
Mean score on Form K (final)	33.00 (M_1)	31.11 (M_2)
Standard deviation on Form K	4.29	4.85
Standard error of means (Form K)	.55	.63
Gain ($M_1 - M_2$)	1.89	
Product-Moment r	.45	

The scores of the equated remedial pupils on Form K ranged from twenty-two to forty-three; those of the non-remedial ones, from nineteen to forty-one. The difference in mean score by the members of the equated groups was one decimal eighty-nine.

On the basis of results by the equated groups on Form K, an ogive was drawn. This is shown in Figure 1.

FIGURE 1.--OGIVE COMPARING PERCENTILES OF
EQUATED GROUPS ON FORM K



The graphs are approximately parallel, with the remedial section showing a slightly higher standing.

in the case of results of the same kind as
 those, as given here. This is shown in figure 1.

FIGURE 1.---RESULTS OF THE SAME KIND AS
 THOSE GIVEN IN FIGURE 1.



FIGURE 2.---RESULTS OF THE SAME KIND AS
 THOSE GIVEN IN FIGURE 1.

The figure is a graph showing the results of the same kind as those given in figure 1. The graph is a plot of the results of the same kind as those given in figure 1. The graph is a plot of the results of the same kind as those given in figure 1.

Table 7 has been drawn up to put in tabular form, the statistics derived from the results of the equated groups on Stanford's Form K test.

TABLE 7.--COMPARING STATISTICS DERIVED FROM RESULTS OF EQUATED REMEDIAL AND NON-REMEDIAL GROUPS ON STANFORD'S FORM K TEST IN ARITHMETIC ACHIEVEMENT

Measure of:		Remedial	Non-Remedial
Central Tendency	True Mode	35.64	33.27
	Median	33.88	31.83
	Mean	33.00	31.11
Variability	Range of Score	21	22
	Q or Probable Error	3.10	3.50
	Q ₁ - First Quartile	30.32	28.25
	Q ₂ - Median	33.88	31.83
	Q ₃ - Third Quartile	36.52	35.25
Mean Variation or Deviation		3.47	3.95
Standard Deviation		4.29	4.85
Measure of Relative Variation		15.45	13.99
Standard Error of Means		.55	.63
Skewness		-.62	-.45
Kurtosis (both slightly leptokurtic)		.288	.279

Table 7 has been added to the end of the report.

The relative decrease from the number of the relative

from the number of the relative.

Table 8 has been added to the end of the report. It shows the relative decrease from the number of the relative.

Relative	Relative	Relative	Relative
10.00	10.00	10.00	10.00
11.11	11.11	11.11	11.11
12.34	12.34	12.34	12.34
13.56	13.56	13.56	13.56
14.78	14.78	14.78	14.78
15.90	15.90	15.90	15.90
17.12	17.12	17.12	17.12
18.34	18.34	18.34	18.34
19.56	19.56	19.56	19.56
20.78	20.78	20.78	20.78
21.90	21.90	21.90	21.90
23.12	23.12	23.12	23.12
24.34	24.34	24.34	24.34
25.56	25.56	25.56	25.56
26.78	26.78	26.78	26.78
27.90	27.90	27.90	27.90
29.12	29.12	29.12	29.12
30.34	30.34	30.34	30.34
31.56	31.56	31.56	31.56
32.78	32.78	32.78	32.78
33.90	33.90	33.90	33.90
35.12	35.12	35.12	35.12
36.34	36.34	36.34	36.34
37.56	37.56	37.56	37.56
38.78	38.78	38.78	38.78
39.90	39.90	39.90	39.90
41.12	41.12	41.12	41.12
42.34	42.34	42.34	42.34
43.56	43.56	43.56	43.56
44.78	44.78	44.78	44.78
45.90	45.90	45.90	45.90
47.12	47.12	47.12	47.12
48.34	48.34	48.34	48.34
49.56	49.56	49.56	49.56
50.78	50.78	50.78	50.78
51.90	51.90	51.90	51.90
53.12	53.12	53.12	53.12
54.34	54.34	54.34	54.34
55.56	55.56	55.56	55.56
56.78	56.78	56.78	56.78
57.90	57.90	57.90	57.90
59.12	59.12	59.12	59.12
60.34	60.34	60.34	60.34
61.56	61.56	61.56	61.56
62.78	62.78	62.78	62.78
63.90	63.90	63.90	63.90
65.12	65.12	65.12	65.12
66.34	66.34	66.34	66.34
67.56	67.56	67.56	67.56
68.78	68.78	68.78	68.78
69.90	69.90	69.90	69.90
71.12	71.12	71.12	71.12
72.34	72.34	72.34	72.34
73.56	73.56	73.56	73.56
74.78	74.78	74.78	74.78
75.90	75.90	75.90	75.90
77.12	77.12	77.12	77.12
78.34	78.34	78.34	78.34
79.56	79.56	79.56	79.56
80.78	80.78	80.78	80.78
81.90	81.90	81.90	81.90
83.12	83.12	83.12	83.12
84.34	84.34	84.34	84.34
85.56	85.56	85.56	85.56
86.78	86.78	86.78	86.78
87.90	87.90	87.90	87.90
89.12	89.12	89.12	89.12
90.34	90.34	90.34	90.34
91.56	91.56	91.56	91.56
92.78	92.78	92.78	92.78
93.90	93.90	93.90	93.90
95.12	95.12	95.12	95.12
96.34	96.34	96.34	96.34
97.56	97.56	97.56	97.56
98.78	98.78	98.78	98.78
99.90	99.90	99.90	99.90
100.00	100.00	100.00	100.00

To help test the reliability of the difference of achievement by the two divisions on test K, Table 8 has been constructed.

TABLE 8.--RELIABILITY OF DIFFERENCE OF ATTAINMENT
BETWEEN THE EQUATED REMEDIAL AND
NON-REMEDIAL GROUPS ON FORM K

	Mean	Standard Deviation	No. Cases
Remedial Group	33.00 (M_1)	4.29	61
Non-Remedial Group	31.11 (M_2)	4.85	61
Difference of Means	1.89		
Standard Error of M_1	.55		
Standard Error of M_2	.63		
Product-Moment r	.45		

The standard deviation difference, using Garrett's¹² formula $SE_D = \sqrt{S_{M_1}^2 + S_{M_2}^2 - 2r_{12} S_{M_1} S_{M_2}}$ was .61.
Critical Ratio $\frac{1.89}{.61} = 3.10$.

A hypothesis that some gain will come about as the result of remedial teaching was set up, and the one-tailed test of significance was applied, since we are interested only in those pupils who showed positive improvement.

¹²Henry E. Garrett, Statistics in Psychology and Education, Fourth Edition. New York: Longman's Green and Co., 1953, p. 226.

to help test the reliability of the instrument
statement of the two divisions of work, which is
also summarized.

TABLE 1. -- SUMMARY OF RESULTS OF THE
TESTS OF THE INSTRUMENT. The results of the
tests of the instrument are given in the
following table.

Item	Standard Deviation	Mean	Range
1. General group	1.00	10.00	10.00
2. Special group	1.00	11.11	11.11
3. Difference of scores	1.00		
4. Standard error of	1.00		
5. Standard error of	1.00		
6. Product-moment	1.00		

The standard deviation difference, which is
the difference between the two groups, is
1.00. The critical value is 1.96.
A hypothesis was made that the difference
between the two groups would be significant.
The results of the tests are given in the
table. The results show that the difference
between the two groups is significant, since the
test of significance was applied, since the
only in two cases the difference was not
significant.

TABLE 1. -- SUMMARY OF RESULTS OF THE
TESTS OF THE INSTRUMENT. The results of the
tests of the instrument are given in the
following table.

With 120 degrees of freedom, a critical ratio of one decimal ninety-eight is significant at the five per cent level and a critical ratio of two decimal sixty-two is significant at the one per cent level.

The results of this investigation, however, must be regarded with caution. The statistical design did not consider the possible effects of differential approaches to remedial teaching. It is thus questionable whether the critical ratio of three decimal ten can be considered as necessarily indicating significant gain in achievement by the remedial group over the non-remedial as a result of the special instruction.

CHAPTER IV

SUMMARY

THE PROBLEM

The purpose of this investigation in Edmonton was to obtain data regarding the efficacy of a remedial arithmetic program in computation in grade eight. Certain administrative problems such as size and selection of classes, timetabling, and availability of time and teachers for the additional course had to be faced.

PROCEDURE

Five of the six Edmonton public schools in which a remedial arithmetic course was attempted, selected their classes on the basis of achievement in arithmetic in the preceding year. These classes then moved as a unit through all the other courses as well. The other school set up its special classes on the basis of achievement on Stanford's Form J test in computation. The remedial pupils in this school left their regular classes for the special instruction periods, and then returned to their original group after each lesson. In all cases, the standard class size of about thirty pupils was maintained.

Form J of Stanford's advanced arithmetic test in computation was used as a preliminary test in October for all the grade eight students in the thirty-three classrooms taking part. This yielded a total population of 975. The eight special classes selected from this population contained 225 students who were given two eight-week periods of instruction and practice. These instruction periods were separated by an eight-week period in which no remedial arithmetic was practised. Total number of remedial class periods in the sixteen weeks varied from thirty to forty, each being about thirty-three minutes in length.

Teachers stressed the meaningful approach, followed by drill and practice exercises. Practice exercises were supplied to the teachers to supplement their own material, and suggestions were given as to the order of their presentation to the pupils. The teachers were not specialists in arithmetic, but all were experienced and interested in the problem.

In May, Stanford's Form K arithmetic achievement test was given to the total population as a final test. One group of sixty-one pupils who had taken remedial courses was paired with sixty-one pupils who had not taken such extra classes. Their I.Q.'s ranged from eighty-two to 125. The main comparison was then made between these two groups

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who were equated according to I.Q. and equal achievement on the initial Form J test.

FINDINGS

The change in grade equivalent from Form J to Form K by the special classes varied from minus decimal six year to plus one decimal six years in the seven-month interval. Individual change in grade equivalent varied from minus three decimal two years to plus four decimal eight years.

The total remedial population had a mean grade equivalent standing of seven decimal five on Form J and eight decimal two on Form K. This represented progress of decimal seven year in the decimal seven year term. The total non-remedial population had a mean grade equivalent standing of eight decimal two on Form J and nine on Form K, showing change of decimal eight year in the decimal seven-year interval.

About twelve per cent of the remedial students and twenty per cent of the non-remedial pupils had poorer grade standings on Form K than they had on Form J.

Approximately sixty-four per cent of those who had extra help and fifty-four per cent of those who did not have additional aid improved more than decimal seven year in grade standing in decimal seven year.

and were operated according to the same principles as the original design.

CONCLUSION

The results of the investigation show that the use of the proposed design for the control of the engine is a very effective method of controlling the engine. The results of the investigation show that the use of the proposed design for the control of the engine is a very effective method of controlling the engine.

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When sixty-one pairs of pupils were equated according to I.Q. and attainment on the preliminary Form J test, and an ogive was constructed, the graph showed a tendency in favor of the tutored scholars.

When results on Form K by the equated groups were analyzed statistically, a critical ratio of three decimal one was obtained. This indicated significant difference in achievement between the two elements at the decimal zero one or decimal zero five level of significance.

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CHAPTER V

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The evidence yielded by this investigation indicates that a remedial program of the type used here, can effect a significant improvement in arithmetic computation.

There was disparity between results obtained by the groups taking part. Some of the factors that probably contributed to these variations were pupil and teacher differences, and varying student attitudes toward the course.

RECOMMENDATIONS

Suggestions that might be considered for future investigations are:

1. An attempt should be made to study the effects of a remedial program on each class taking part, and thus try to eliminate some of the variables that affected this one. Thus more specific ideas regarding effectiveness of different methods might be forthcoming.
2. The selection of pupils for special help might involve:
 - (a) The use of standardized arithmetic achievement tests.

DEPARTMENT OF AGRICULTURE

RESEARCH

The following is a summary of the results of the research conducted by the Department of Agriculture in the field of plant pathology. The research was conducted by the Plant Pathology Division, which is a part of the Bureau of Plant Industry. The results of the research are as follows:

1. The results of the research show that the use of certain chemical compounds can effectively control the growth of certain plant pathogens. These compounds are known as fungicides, and they are used to protect plants from diseases caused by fungi. The results of the research show that the use of these compounds can significantly reduce the damage caused by plant pathogens to crops.

2. The results of the research also show that the use of certain biological agents can effectively control the growth of certain plant pathogens. These agents are known as biocontrol agents, and they are used to protect plants from diseases caused by fungi. The results of the research show that the use of these agents can significantly reduce the damage caused by plant pathogens to crops.

CONCLUSIONS

The results of the research show that the use of certain chemical compounds can effectively control the growth of certain plant pathogens.

RECOMMENDATIONS

1. It is recommended that the use of certain chemical compounds be continued in the control of plant pathogens.
2. It is recommended that the use of certain biological agents be continued in the control of plant pathogens.
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10. It is recommended that the use of certain biological agents be continued in the control of plant pathogens.

- (b) Recognition of the limitations of selection on the basis of I.Q.
 - (c) Flexible grouping in order to insure that remedial pupils will not be segregated.
3. The selection of teachers for this course:
- (a) Only teachers who are particularly interested in remedial work should be assigned to such classes.
 - (b) Such teachers should have special training in this field, and should be the instructors presenting the regular mathematics lessons.
 - (c) The teachers should be inspirational, sympathetic and patient. Pupils who have not the will to learn will not learn.
4. Timetabling
- (a) Every effort should be made to have the timetable fit the desired program. The program should not have to be altered to suit the timetable.
 - (b) Since there is leeway in the number of periods to be used for exploratory subjects, these might be reduced to a minimum, making more time available for remedial work. Those pupils who were not in the special class would then have available a similar number of

1. The Commission of the European Communities (CEC) is the main body responsible for the implementation of the Treaty of Rome.

2. The CEC is composed of representatives of the member states.

3. The CEC is responsible for the management of the Community's budget.

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25. The CEC is the main body responsible for the implementation of the Treaty of Rome.

periods for enrichment work.

- (c) More time could also be obtained by using part of the regular mathematics periods for corrective lessons.
- (d) A class size of thirty is too large for remedial work, although some favourable progress might be made if positive attitudes to study and learning could be developed. At present it does not seem possible to decrease the size of classes in Edmonton.

5. Methods

- (a) Students who understand the number system and the operations that can be carried out with it, and who have the proper learning attitude can be helped. Several approaches, rather than any one alone, should be used. One method might strike the proper chord in one pupil, where another has failed.
- (b) Care must be taken in the use of manipulative materials in grade eight. Improper use or application may cause children to consider such things childish.

6. Materials

- (a) Many workbooks are available, but care should be taken in their selection. They should give

much practice in the basic arithmetic skills. The exercises should be so arranged that the skills are repeated as they accumulate.

- (b) The teachers of this special subject could co-operate in drawing up the type of exercises that would be found necessary. (See Appendix A for the kind of exercises developed in such a manner for this investigation. They were planned so as to have three levels of difficulty for each of the fundamental operations).
- (c) Individual teachers could develop their own meaningful practice exercises that would fit in to the local situation.
- (d) Most modern texts include review exercises; teachers must be selective.
- (e) Pupils enjoy mental arithmetic if it is not too easy or too hard. The teacher must be able to decide the degree of difficulty best suited for his particular group.
- (f) Standardized achievement tests should be available for initial and for final testing. These tests could be developed within a school system, or could be purchased from test makers. Teachers should be able to make at least a simple statistical analysis of the results and to interpret them.

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APPENDIX A
PRACTISE EXERCISES USED

EDMONTON PUBLIC SCHOOL BOARD

<u>SERIES I</u>		<u>ADDITION</u>		<u>LEVEL A.</u>					
1.	534	2.	432.6	3.	613	4.	\$32.62	5.	7.432
	362		624.5		150		25.53		51.37
	235		593.7		325		64.32		1.735
	614		145.3		534		52.13		415.7
	165		235.2		625		43.51		34.215
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	<u> </u>		<u> </u>		<u> </u>		<u> </u>		<u> </u>
6.	6025	7.	372	8.	42.65	9.	246	10.	24653
	5711		473		41.70		403		32654
	3154		352		74.02		552		13564
	2664		234		21.64		340		46532
	4307		425		<u>35.24</u>		640		70154
	<u>4405</u>		605		<u> </u>		457		<u>47125</u>
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11.	213	12.	3162	13.	3.54	14.	492	15.	73514
	324		5104		2.64		365		57325
	435		5236		6.25		423		61947
	546		4355		3.54		342		54236
	657		5266		<u>6.23</u>		942		<u>27653</u>
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<u>SERIES I</u>		<u>ADDITION</u>		<u>LEVEL B.</u>					
1.	567	2.	538.2	3.	60785	4.	3905	5.	\$85.23
	778		677.5		86704		3868		66.57
	865		632.8		48276		8745		78.52
	753		587.6		65329		7528		65.36
	826		<u>642.5</u>		<u>54357</u>		5869		<u>45.65</u>
	682		<u> </u>		<u> </u>		4786		<u> </u>
	<u>747</u>		<u> </u>		<u> </u>		<u>3297</u>		<u> </u>

6. 783 587 697 379 784 756 <u>647</u>	7. 76895 57968 75789 87965 <u>97864</u>	8. 888 777 666 555 999 987 <u>876</u>	9. 68.97 5.325 657.4 8.39 <u>85.261</u>	10. 379 937 793 658 586 865 <u>479</u>
11. 7667 8268 6786 5987 6556 7892 <u>5784</u>	12. 5.78 8.57 7.85 6.93 3.69 9.36 <u>2.87</u>	13. 7982 4676 4398 5267 <u>7543</u>	14. 478 295 664 579 822 682 <u>957</u>	15. 3976 6379 8254 4852 7654 <u>4756</u>

SERIES ISUBTRACTION TESTLEVEL A.

1. 471 <u>238</u>	2. 546 <u>229</u>	3. 432 <u>160</u>	4. 502 <u>138</u>	5. 906 <u>308</u>
6. 834 <u>158</u>	7. 673 <u>24</u>	8. 310 <u>240</u>	9. 11.45 <u>9.20</u>	10. 14.85 <u>0.65</u>
11. 726.03 <u>14.04</u>	12. 74.32 <u>26.07</u>	13. 3.0567 <u>2.78</u>	14. 7.2 <u>.035</u>	

SERIES ISUBTRACTION TESTLEVEL B.

1. 6000 <u>2312</u>	2. 8010 <u>4007</u>	3. 5200 <u>3209</u>	4. 7352 <u>68</u>	5. 9301 <u>725</u>
6. 707 <u>518</u>	7. 724 <u>389</u>	8. 525 <u>496</u>	9. 537 <u>168</u>	10. 855 <u>295</u>
11. 632.05 <u>421.83</u>	12. 902.20 <u>46.03</u>	13. 431.00 <u>35.02</u>	14. 3925.6 <u>738.</u>	

SERIES IMULTIPLICATIONLEVEL A.

1.	(a)	(b)	(c)	(d)	(e)
	$7 \times 8 =$	$23 \times 3 =$	$20 \times 4 =$	$71 \times 3 =$	$812 \times 4 =$
2.	$\begin{array}{r} 340 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 601 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 400 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 2010 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 504 \\ \times 7 \\ \hline \end{array}$
3.	$\begin{array}{r} 16 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 87 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 615 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 851 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 657 \\ \times 9 \\ \hline \end{array}$

SERIES IMULTIPLICATIONLEVEL B.

1.	(a)	(b)	(c)	(d)	(e)
	$\begin{array}{r} 32 \\ \times 21 \\ \hline \end{array}$	$\begin{array}{r} 412 \\ \times 23 \\ \hline \end{array}$	$\begin{array}{r} 230 \\ \times 22 \\ \hline \end{array}$	$\begin{array}{r} 612 \\ \times 30 \\ \hline \end{array}$	$\begin{array}{r} 312 \\ \times 400 \\ \hline \end{array}$
2.	$\begin{array}{r} 412 \\ \times 103 \\ \hline \end{array}$	$\begin{array}{r} 3004 \\ \times 22 \\ \hline \end{array}$	$\begin{array}{r} 52 \\ \times 93 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ \times 85 \\ \hline \end{array}$	$\begin{array}{r} 369 \\ \times 78 \\ \hline \end{array}$
3.	$\begin{array}{r} 849 \\ \times 90 \\ \hline \end{array}$	$\begin{array}{r} 708 \\ \times 96 \\ \hline \end{array}$	$\begin{array}{r} 9005 \\ \times 65 \\ \hline \end{array}$	$\begin{array}{r} 9080 \\ \times 23 \\ \hline \end{array}$	$\begin{array}{r} 143 \\ \times 96 \\ \hline \end{array}$

SERIES IDIVISIONLEVEL A.

1. $57 \overline{)3876}$	2. $39 \overline{)2964}$	3. $71 \overline{)3408}$
4. $90 \overline{)5670}$	5. $42 \overline{)3570}$	6. $.78 \overline{)35.88}$
7. $.91 \overline{)32.76}$	8. $52 \overline{)400.4}$	9. $326 \overline{)18582}$
10. $.69 \overline{)2967}$	11. $423 \overline{)106173}$	12. $508 \overline{)18796}$

SERIES IDIVISIONLEVEL B.

1. $367 \overline{)109366}$
 4. $704 \overline{)231616}$
 7. $573 \overline{)1512.72}$

2. $471 \overline{)165792}$
 5. $620 \overline{)269747}$
 8. $843 \overline{)3886.23}$

2. $547 \overline{)173946}$
 6. $5.62 \overline{)221.428}$
 9. $624 \overline{)234000}$

SERIES IIADDITIONLEVEL A.

1.	(a)	(b)	(c)	(d)	(e)
	234	156	222.3	542.1	321
	115	224	143.2	325.4	514
	504	312	545.1	231.3	235
	220	432	<u>334.6</u>	<u>425.5</u>	402
	<u>332</u>	<u>143</u>	_____	_____	154
	_____	_____			<u>235</u>

	(f)	(g)	(h)	(i)	(j)
	525	\$22.46	\$34.25	442	322
	433	15.21	25.60	524	441
	242	32.32	34.24	135	255
	455	<u>24.51</u>	<u>10.02</u>	204	424
	234	_____	_____	534	253
	<u>520</u>	_____	_____	<u>150</u>	<u>522</u>
	_____			_____	_____

	(k)	(l)	(m)	(n)	(o)
	33.45	52.44	2345	5014	4.213
	24.23	34.51	2014	2331	3.145
	41.32	22.23	4202	4533	5.502
	<u>30.04</u>	<u>11.35</u>	3231	2142	<u>1.431</u>
	_____	_____	<u>5424</u>	<u>3550</u>	_____
			_____	_____	

	(p)	(q)	(r)	(s)	(t)
	2.445	1422	2054	423.2	24.04
	3.104	3154	4512	15.41	5.412
	2.550	2441	3120	145.032	142.4
	<u>4.231</u>	1052	4423	<u>4.24</u>	<u>30.024</u>
		<u>3414</u>	<u>1542</u>	_____	_____
		_____	_____		

<u>NAME</u>	<u>AGE</u>	<u>RELATION</u>	<u>STATUS</u>
STEWART,VALE .8	WINTER,VALE .8	EDWARDS,VALE .8	
WINTER,VALE .8	WINTER,VALE .8	EDWARDS,VALE .8	
WINTER,VALE .8	WINTER,VALE .8	EDWARDS,VALE .8	

SERIES IIADDITIONLEVEL B.

1. (a)	(b)	(c)	(d)	(e)
467	324	463.7	325.1	352
235	227	255.2	246.6	243
671	526	346.5	721.3	524
430	431	260.3	244.4	351
266	205	<u>521.4</u>	<u>562.2</u>	422
<u>571</u>	<u>762</u>	_____	_____	130
_____	_____			<u>543</u>
(f)	(g)	(h)	(i)	(j)
324	\$26.54	\$31.25	365	742
502	32.33	12.62	721	316
215	15.42	34.10	416	265
331	43.21	54.56	352	410
420	<u>54.15</u>	<u>23.41</u>	470	562
143	_____	_____	223	134
<u>234</u>			<u>105</u>	<u>601</u>
_____			_____	_____
(k)	(l)	(m)	(n)	(o)
62.34	51.46	3451	4051	4.623
41.55	23.11	2546	2314	1.544
26.26	42.23	3022	3204	3.141
33.40	34.20	4213	5122	2.233
<u>10.52</u>	<u>10.42</u>	1345	3415	<u>6.356</u>
_____	_____	<u>5114</u>	<u>1533</u>	_____
		_____	_____	
(p)	(q)	(r)	(s)	(t)
5.134	5416	2130	33.54	52.4
4.225	2351	4526	25.046	34.071
3.430	4142	3312	33.15	21.23
2.551	3324	4254	64.205	46.145
<u>1.312</u>	6623	3063	<u>41.6</u>	<u>10.06</u>
_____	<u>1055</u>	<u>5412</u>	_____	_____
	_____	_____		

1. 1972

(1)	(2)
844	1.244
845	2.144
846	3.144
847	4.144
848	5.144
849	6.144
850	7.144

(1)	(2)
851	8.144
852	9.144
853	10.144
854	11.144
855	12.144
856	13.144
857	14.144

(1)	(2)
858	15.144
859	16.144
860	17.144
861	18.144
862	19.144
863	20.144
864	21.144

(1)	(2)
865	22.144
866	23.144
867	24.144
868	25.144
869	26.144
870	27.144
871	28.144

2. 1973

(1)
872
873
874
875
876
877
878

(1)
879
880
881
882
883
884
885

(1)
886
887
888
889
890
891
892

(1)
893
894
895
896
897
898
899

3. 1974

(1)	(2)
900	1.144
901	2.144
902	3.144
903	4.144
904	5.144
905	6.144
906	7.144

(1)	(2)
907	8.144
908	9.144
909	10.144
910	11.144
911	12.144
912	13.144
913	14.144

(1)	(2)
914	15.144
915	16.144
916	17.144
917	18.144
918	19.144
919	20.144
920	21.144

(1)	(2)
921	22.144
922	23.144
923	24.144
924	25.144
925	26.144
926	27.144
927	28.144

SERIES IISUBTRACTIONLEVEL A.

1. 945 <u>139</u> —	2. 754 <u>438</u> —	3. 420 <u>136</u> —	4. 544 <u>184</u> —	5. 786 <u>194</u> —
6. 502 <u>138</u> —	7. 801 <u>409</u> —	8. 654 <u>230</u> —	9. 13.25 <u>1.45</u> —	10. 1.80 <u>.95</u> —
11. 46.30 <u>4.04</u> —	12. 75.03 <u>16.24</u> —	13. 10000 <u>8257</u> —	14. 1.034 <u>.78</u> —	

SERIES IISUBTRACTION TESTLEVEL B.

1. 23.171 <u>16.172</u> —	2. 12.050 <u>8.068</u> —	3. 25.000 <u>12.005</u> —	4. 3000 <u>2045</u> —	5. 8010 <u>4007</u> —
6. 4001 <u>1001</u> —	7. 5240 <u>743</u> —	8. 9301 <u>4526</u> —	9. 801 <u>409</u> —	10. 508 <u>389</u> —
11. 810 <u>379</u> —	12. 968 <u>188</u> —	13. 108.55 <u>9.7</u> —	14. 207692 <u>8751</u> —	

SERIES IIMULTIPLICATIONLEVEL A.

1. (a)	(b)	(c)	(d)	(e)
16 <u>x5</u> —	65 <u>x6</u> —	216 <u>x7</u> —	321 <u>x8</u> —	4162 <u>x4</u> —
2. 203 <u>x3</u> —	200 <u>x4</u> —	206 <u>x6</u> —	4007 <u>x8</u> —	4080 <u>x9</u> —
3. 29 <u>x7</u> —	87 <u>x8</u> —	85 <u>x6</u> —	368 <u>x5</u> —	2157 <u>x4</u> —

SERIES IIMULTIPLICATIONLEVEL B.

1. (a)	(b)	(c)	(d)	(e)
$\begin{array}{r} 47 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 416 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 531 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 3518 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 4976 \\ \times 4 \\ \hline \end{array}$
2. $\begin{array}{r} 309 \\ \times 63 \\ \hline \end{array}$	$\begin{array}{r} 900 \\ \times 87 \\ \hline \end{array}$	$\begin{array}{r} 807 \\ \times 42 \\ \hline \end{array}$	$\begin{array}{r} 5060 \\ \times 35 \\ \hline \end{array}$	$\begin{array}{r} 7008 \\ \times 91 \\ \hline \end{array}$
3. $\begin{array}{r} 674 \\ \times 501 \\ \hline \end{array}$	$\begin{array}{r} 845 \\ \times 410 \\ \hline \end{array}$	$\begin{array}{r} 2107 \\ \times 653 \\ \hline \end{array}$	$\begin{array}{r} 3017 \\ \times 209 \\ \hline \end{array}$	$\begin{array}{r} 2108 \\ \times 3007 \\ \hline \end{array}$

SERIES IIDIVISIONLEVEL A.

1. $17 \overline{)1666}$	2. $28 \overline{)1512}$	3. $46 \overline{)7268}$
4. $53 \overline{)13038}$	5. $39 \overline{)2886}$	6. $86 \overline{)2494}$
7. $.86 \overline{)40.42}$	8. $.74 \overline{).4292}$	9. $706 \overline{)38124}$
10. $5.8 \overline{)504.6}$	11. $74 \overline{)288.6}$	10. $316 \overline{)80264}$

SERIES IIDIVISIONLEVEL B.

1. $245 \overline{)92361}$	2. $547 \overline{)143862}$	3. $3.18 \overline{)2353.20}$
4. $504 \overline{)3165.12}$	5. $21.8 \overline{)1401.74}$	6. $560 \overline{)231280}$
7. $418 \overline{)239514}$	8. $528 \overline{)182722}$	9. $634 \overline{)3341.18}$

ADDITION OF FRACTIONSLEVEL A.

A. (1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{8}$	$\frac{2}{10}$	$\frac{3}{6}$	$\frac{5}{8}$	$\frac{2}{10}$	$\frac{4}{12}$
$\frac{2}{8}$	$\frac{3}{10}$	$\frac{2}{6}$	$\frac{2}{8}$	$\frac{2}{10}$	$\frac{5}{12}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

B.	(1)	(2)	(3)	(4)	(5)	(6)
	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{5}{8}$	$\frac{5}{6}$	$\frac{3}{4}$	$\frac{5}{8}$
	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{16}$	$\frac{5}{16}$
C.	(1)	(2)	(3)	(4)	(5)	(6)
	$\frac{5}{8}$	$\frac{2}{3}$	$\frac{5}{16}$	$\frac{1}{2}$	$\frac{7}{10}$	$\frac{7}{10}$
	$\frac{3}{16}$	$\frac{5}{6}$	$\frac{3}{4}$	$\frac{1}{4}$	$\frac{3}{5}$	$\frac{4}{5}$
	$\frac{3}{4}$	$\frac{7}{12}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{3}{5}$
D.	(1)	(2)	(3)	(4)	(5)	(6)
	$1\frac{5}{16}$	$2\frac{1}{2}$	$5\frac{7}{10}$	$8\frac{7}{10}$	$3\frac{1}{2}$	7
	$3\frac{5}{8}$	$5\frac{1}{4}$	$2\frac{3}{5}$	$2\frac{4}{5}$	$2\frac{2}{3}$	$2\frac{7}{12}$
				$5\frac{6}{10}$	$5\frac{3}{4}$	$5\frac{3}{4}$

ADDITIONS OF FRACTIONSLEVEL B.

ADD. Reduce the answers to the lowest possible terms.

A.	(1)	(2)	(3)	(4)	(5)	(6)
	$1\frac{5}{6}$	$7\frac{1}{5}$	$7\frac{1}{2}$	$3\frac{1}{2}$	$7\frac{1}{2}$	$2\frac{3}{4}$
	$2\frac{1}{4}$	$3\frac{9}{10}$	$\frac{5}{6}$	$6\frac{2}{3}$	$2\frac{1}{5}$	$16\frac{7}{8}$

B.	(1)	(2)	(3)	(4)	(5)	(6)
	$4 \frac{2}{3}$	$3 \frac{1}{2}$	$7 \frac{9}{10}$	$4 \frac{1}{2}$	$3 \frac{2}{12}$	$\frac{1}{12}$
	$5 \frac{1}{4}$	$9 \frac{3}{4}$	$4 \frac{3}{5}$	$\frac{1}{3}$	$\frac{4}{6}$	$11 \frac{5}{6}$
	$\frac{5}{6}$	$7 \frac{1}{8}$	$8 \frac{1}{2}$	$9 \frac{5}{6}$	$5 \frac{1}{3}$	$9 \frac{1}{4}$
C.	(1)	(2)	(3)	(4)	(5)	(6)
	$\frac{3}{10}$	$\frac{3}{8}$	$4 \frac{5}{8}$	$3 \frac{4}{5}$	$2 \frac{5}{12}$	$12 \frac{1}{5}$
	$\frac{4}{10}$	$\frac{5}{16}$	$5 \frac{3}{16}$	$2 \frac{3}{10}$	$3 \frac{11}{12}$	$6 \frac{1}{2}$
D.	(1)	(2)	(3)	(4)	(5)	(6)
	$2 \frac{15}{16}$	$2 \frac{5}{12}$	$14 \frac{1}{4}$	$\frac{1}{4}$	$8 \frac{2}{3}$	$15 \frac{1}{6}$
	$18 \frac{1}{4}$	$13 \frac{5}{6}$	$8 \frac{4}{5}$	6	$4 \frac{7}{8}$	$8 \frac{7}{12}$
	$3 \frac{5}{8}$	$7 \frac{1}{2}$		$\frac{3}{10}$		$5 \frac{1}{2}$

SUBTRACTION OF FRACTIONSLEVEL A.

A. 1. Change the following fractions to have a denominator of 12.

(a) $\frac{3}{4} =$

(b) $\frac{1}{6} =$

(c) $\frac{1}{2} =$

2. Write the missing numerators in the proper places.

(a) $\frac{1}{6} = \frac{\quad}{42}$

(b) $\frac{5}{6} = \frac{\quad}{24}$

(c) $\frac{2}{3} = \frac{\quad}{27}$

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
(7)	(8)	(9)	(10)	(11)	(12)
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
(13)	(14)	(15)	(16)	(17)	(18)
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$

THESE ARE THE RESULTS OF THE CALCULATIONS.

THESE ARE THE RESULTS OF THE CALCULATIONS.

3. Change to mixed numbers.

(a) $\frac{27}{20} =$

(b) $\frac{25}{15} =$

(c) $\frac{18}{5} =$

B. Subtract. (Give answers in the lowest terms).

(1)	(2)	(3)	(4)	(5)	(6)
$8\frac{4}{6}$	$5\frac{3}{4}$	$3\frac{10}{12}$	$8\frac{3}{5}$	$4\frac{5}{6}$	$9\frac{7}{8}$

$-4\frac{3}{6}$	$-2\frac{2}{4}$	$-1\frac{3}{12}$	$-4\frac{3}{5}$	$-\frac{4}{6}$	-6
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

C. (1) (2) (3) (4) (5) (6)

$\frac{3}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{12}$	$\frac{7}{16}$	$\frac{5}{8}$
$-\frac{1}{4}$	$-\frac{5}{8}$	$-\frac{1}{4}$	$-\frac{1}{6}$	$-\frac{1}{4}$	$-\frac{1}{2}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

D. (1) (2) (3) (4) (5) (6)

$5\frac{3}{4}$	$8\frac{11}{12}$	$7\frac{3}{4}$	$8\frac{1}{2}$	$7\frac{3}{4}$	$4\frac{5}{6}$
$-2\frac{1}{2}$	$-2\frac{1}{3}$	$-2\frac{5}{12}$	$-3\frac{3}{8}$	$-\frac{3}{8}$	$-\frac{2}{3}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

SUBTRACTION OF FRACTIONS

LEVEL B.

(Reduce answers to lowest terms)

A. (1) (2) (3) (4) (5) (6)

$3\frac{1}{6}$	$5\frac{5}{6}$	$9\frac{1}{4}$	$9\frac{2}{3}$	10	9
$-1\frac{5}{12}$	$-\frac{1}{4}$	$-2\frac{1}{3}$	$-2\frac{3}{4}$	$-1\frac{7}{8}$	$-5\frac{3}{4}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

3. Given in each exercise

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$

4. Find the value of each expression

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
(7)	(8)	(9)	(10)	(11)	(12)
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
(13)	(14)	(15)	(16)	(17)	(18)
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$

Answer each question in the space provided

5. Find the value of each expression

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$

B.	(1)	(2)	(3)	(4)	(5)	(6)
	$15 \frac{5}{8}$	$9 \frac{3}{10}$	$6 \frac{1}{8}$	$23 \frac{3}{5}$	$8 \frac{3}{16}$	$16 \frac{1}{2}$
	$-9 \frac{11}{12}$	$-6 \frac{4}{5}$	$-3 \frac{1}{4}$	$-8 \frac{7}{10}$	$-4 \frac{1}{2}$	$-6 \frac{7}{12}$
C.	(1)	(2)	(3)	(4)	(5)	(6)
	$7 \frac{1}{2}$	$9 \frac{1}{2}$	$10 \frac{5}{12}$	$5 \frac{3}{4}$	$22 \frac{1}{4}$	$5 \frac{3}{16}$
	$-4 \frac{7}{8}$	$-4 \frac{13}{16}$	$-7 \frac{5}{6}$	$-1 \frac{7}{8}$	$-12 \frac{1}{2}$	$-1 \frac{3}{4}$
D.	(1)	(2)	(3)	(4)	(5)	(6)
	$7 \frac{1}{2}$	$8 \frac{5}{12}$	$3 \frac{7}{8}$	$11 \frac{1}{8}$	$12 \frac{13}{16}$	$12 \frac{1}{4}$
	$-6 \frac{9}{10}$	$-2 \frac{1}{2}$	$-1 \frac{3}{4}$	$-10 \frac{1}{2}$	$- \frac{3}{8}$	$-6 \frac{3}{5}$
E.	(1)	(2)	(3)			
	$9 \frac{3}{4}$	$12 \frac{1}{6}$	$9 \frac{1}{5}$			
	$-1 \frac{2}{3}$	$-10 \frac{1}{5}$	$-4 \frac{7}{10}$			

MULTIPLICATION OF FRACTIONSLEVEL A.

1. $\frac{1}{4} \times \frac{1}{3} =$

2. $\frac{1}{2} \times \frac{3}{4} =$

3. $\frac{3}{7} \times \frac{7}{11} =$

4. $\frac{5}{8} \times \frac{6}{7} =$

5. $1 \frac{1}{2} \times \frac{5}{6} =$

6. $2 \frac{2}{3} \times 1 \frac{1}{8} =$

7. $1 \frac{1}{6} \times 1 \frac{1}{6} =$

8. $3 \frac{1}{7} \times 1 \frac{3}{11} =$

9. $\frac{1}{2} \times 76 =$

10. $65 \times 1 \frac{1}{5} =$

MULTIPLICATION OF FRACTIONSLEVEL B.

1. $\frac{2}{3} \times \frac{7}{8} =$

2. $2\frac{2}{3} \times 1\frac{1}{3} =$

3. $\frac{3}{4} \times 96 =$

4. $4\frac{1}{3} \times \frac{9}{39} =$

5. $5\frac{1}{6} \times \frac{6}{7} =$

6. $8\frac{1}{10} \times 2\frac{2}{9} =$

7. $7\frac{2}{3} \times 81 =$

DIVISION OF FRACTIONSLEVEL A.

1. $\frac{1}{4} \div \frac{1}{2} =$

2. $16 \div \frac{1}{4} =$

3. $\frac{1}{4} \div 16 =$

4. $\frac{2}{5} \div \frac{2}{15} =$

5. $1\frac{1}{4} \div 2\frac{2}{3} =$

6. $2\frac{1}{3} \div 4\frac{1}{12} =$

7. $12 \div 3\frac{1}{8} =$

8. $6\frac{2}{3} \div 6\frac{1}{4} =$

SERIES IADDITIONLEVEL C.

$$\begin{array}{r}
 1. \quad 796 \\
 987 \\
 568 \\
 749 \\
 954 \\
 876 \\
 \hline
 759 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 2. \quad 768.59 \\
 49.867 \\
 6.389 \\
 798.62 \\
 \hline
 94.8 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3. \quad 687 \\
 974 \\
 865 \\
 749 \\
 967 \\
 894 \\
 \hline
 976 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 4. \quad \$92.57 \\
 69.74 \\
 98.68 \\
 59.76 \\
 \hline
 84.92 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 5. \quad 876 \\
 967 \\
 587 \\
 894 \\
 579 \\
 768 \\
 \hline
 849 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 6. \quad 79.86 \\
 87.94 \\
 49.76 \\
 58.66 \\
 \hline
 77.94 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 7. \quad 785 \\
 976 \\
 687 \\
 594 \\
 976 \\
 489 \\
 \hline
 946 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 8. \quad 6987 \\
 7925 \\
 8948 \\
 7653 \\
 \hline
 9876 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 9. \quad 8.79 \\
 9.68 \\
 7.98 \\
 9.87 \\
 6.98 \\
 \hline
 7.79 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 10. \quad 769 \\
 987 \\
 896 \\
 995 \\
 897 \\
 798 \\
 \hline
 697 \\
 \hline
 \end{array}$$

11. 987.65	12. 986	13. 9876	14. 876	15. 9876
879.69	987	6798	698	7849
985.96	589	8948	849	9768
<u>689.76</u>	769	9765	937	7766
	877	<u>6895</u>	765	5497
	<u>496</u>		598	<u>7986</u>
			<u>789</u>	

SERIES ISUBTRACTION TESTLEVEL C.

1. 4643218	2. 75126.3	3. 8340027
<u>2715302</u>	<u>60392.4</u>	<u>2437312</u>
4. 62048.2	5. 3092157	6. 4205.34
<u>8914.4</u>	<u>943509</u>	<u>2418.72</u>
7. 3085649	8. 4078.63	9. 3612043
<u>87025</u>	<u>808.09</u>	<u>1753068</u>
10. 635.402	11. 478.32	12. 987003.10
<u>328.328</u>	<u>60.02</u>	<u>60402.09</u>
13. 54.603	14. 80392	
<u>17.95</u>	<u>19875</u>	

SERIES IMULTIPLICATIONLEVEL C.

1. (a)	(b)	(c)	(d)
8259	3467	4637	2859
<u>x28</u>	<u>x93</u>	<u>x82</u>	<u>x47</u>
2. 7436	5289	6473	8529
<u>x65</u>	<u>x39</u>	<u>x740</u>	<u>x56</u>
3. 8632	5947	3268	4795
<u>x206</u>	<u>x62</u>	<u>x95</u>	<u>x83</u>

SERIES IDIVISIONLEVEL C.

1. $56 \overline{)17080}$

2. $79 \overline{)45820}$

3. $245 \overline{)1719.9}$

4. $389 \overline{)27278}$

5. $326 \overline{)1760529}$

6. $347 \overline{)3125.776}$

7. $684 \overline{)5460372}$

8. $736 \overline{)5954975}$

9. $6.87 \overline{)67188.6}$

ADDITION OF FRACTIONSLEVEL C.

A.	(1)	(2)	(3)	(4)	(5)	(6)
	$\frac{3}{6} + \frac{1}{6} =$	$\frac{5}{8} + \frac{7}{8} =$	$6 \frac{7}{8}$	$3 \frac{7}{12}$	$4 \frac{3}{10}$	$16 \frac{1}{3}$

$3 \frac{1}{8}$	$1 \frac{1}{12}$	$9 \frac{4}{5}$	$7 \frac{1}{6}$
<hr/>	<hr/>	<hr/>	<hr/>

B.	(1)	(2)	(3)	(4)	(5)	(6)
	$4 \frac{4}{5}$	$7 \frac{1}{3}$	$9 \frac{1}{3}$	$14 \frac{3}{5}$	$20 \frac{5}{6}$	$\frac{1}{2}$

$9 \frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{2}$	$6 \frac{1}{4}$	$18 \frac{1}{4}$	$\frac{2}{3}$
-----------------	---------------	---------------	-----------------	------------------	---------------

$6 \frac{3}{4}$	$8 \frac{5}{6}$	$2 \frac{3}{5}$	$3 \frac{1}{8}$	$6 \frac{2}{3}$	$\frac{1}{4}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

C.	(1)	(2)	(3)	(4)	(5)	(6)
	$2 \frac{1}{8}$	$4 \frac{1}{2}$	$5 \frac{4}{5}$	$3 \frac{1}{4}$	$2 \frac{1}{3}$	$9 \frac{1}{2}$

$2 \frac{5}{6}$	$1 \frac{2}{3}$	$6 \frac{2}{3}$	$1 \frac{3}{5}$	$3 \frac{5}{6}$	$8 \frac{3}{4}$
-----------------	-----------------	-----------------	-----------------	-----------------	-----------------

$10 \frac{2}{3}$	$\frac{3}{4}$	$7 \frac{7}{15}$	$7 \frac{2}{3}$	$4 \frac{1}{6}$	$7 \frac{1}{6}$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2} \text{ 1-}$	$\frac{1}{2} \text{ 2-}$	$\frac{1}{2} \text{ 3-}$	$\frac{1}{2} \text{ 4-}$	$\frac{1}{2} \text{ 5-}$	$\frac{1}{2} \text{ 6-}$
$\frac{1}{2} \text{ 7-}$	$\frac{1}{2} \text{ 8-}$	$\frac{1}{2} \text{ 9-}$	$\frac{1}{2} \text{ 10-}$	$\frac{1}{2} \text{ 11-}$	$\frac{1}{2} \text{ 12-}$

1-12-12

1-12-12

1-12-12

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2} \text{ 1-}$	$\frac{1}{2} \text{ 2-}$	$\frac{1}{2} \text{ 3-}$	$\frac{1}{2} \text{ 4-}$	$\frac{1}{2} \text{ 5-}$	$\frac{1}{2} \text{ 6-}$
$\frac{1}{2} \text{ 7-}$	$\frac{1}{2} \text{ 8-}$	$\frac{1}{2} \text{ 9-}$	$\frac{1}{2} \text{ 10-}$	$\frac{1}{2} \text{ 11-}$	$\frac{1}{2} \text{ 12-}$
$\frac{1}{2} \text{ 13-}$	$\frac{1}{2} \text{ 14-}$	$\frac{1}{2} \text{ 15-}$	$\frac{1}{2} \text{ 16-}$	$\frac{1}{2} \text{ 17-}$	$\frac{1}{2} \text{ 18-}$
$\frac{1}{2} \text{ 19-}$	$\frac{1}{2} \text{ 20-}$	$\frac{1}{2} \text{ 21-}$	$\frac{1}{2} \text{ 22-}$	$\frac{1}{2} \text{ 23-}$	$\frac{1}{2} \text{ 24-}$
$\frac{1}{2} \text{ 25-}$	$\frac{1}{2} \text{ 26-}$	$\frac{1}{2} \text{ 27-}$	$\frac{1}{2} \text{ 28-}$	$\frac{1}{2} \text{ 29-}$	$\frac{1}{2} \text{ 30-}$
$\frac{1}{2} \text{ 31-}$	$\frac{1}{2} \text{ 32-}$	$\frac{1}{2} \text{ 33-}$	$\frac{1}{2} \text{ 34-}$	$\frac{1}{2} \text{ 35-}$	$\frac{1}{2} \text{ 36-}$
$\frac{1}{2} \text{ 37-}$	$\frac{1}{2} \text{ 38-}$	$\frac{1}{2} \text{ 39-}$	$\frac{1}{2} \text{ 40-}$	$\frac{1}{2} \text{ 41-}$	$\frac{1}{2} \text{ 42-}$
$\frac{1}{2} \text{ 43-}$	$\frac{1}{2} \text{ 44-}$	$\frac{1}{2} \text{ 45-}$	$\frac{1}{2} \text{ 46-}$	$\frac{1}{2} \text{ 47-}$	$\frac{1}{2} \text{ 48-}$
$\frac{1}{2} \text{ 49-}$	$\frac{1}{2} \text{ 50-}$	$\frac{1}{2} \text{ 51-}$	$\frac{1}{2} \text{ 52-}$	$\frac{1}{2} \text{ 53-}$	$\frac{1}{2} \text{ 54-}$
$\frac{1}{2} \text{ 55-}$	$\frac{1}{2} \text{ 56-}$	$\frac{1}{2} \text{ 57-}$	$\frac{1}{2} \text{ 58-}$	$\frac{1}{2} \text{ 59-}$	$\frac{1}{2} \text{ 60-}$

D. (1)	(2)	(3)	(4)	(5)	(6)
$5 \frac{1}{2}$	$9 \frac{3}{4}$	$8 \frac{1}{5}$	$4 \frac{3}{4}$	$9 \frac{1}{4}$	$3 \frac{1}{16}$
$-3 \frac{3}{5}$	$-5 \frac{5}{6}$	$-4 \frac{1}{3}$	$-1 \frac{8}{9}$	$-4 \frac{2}{3}$	$-1 \frac{1}{3}$

DIVISION OF FRACTIONSLEVEL B.

1. $\frac{1}{8} \div \frac{1}{17} =$ 2. $1 \frac{1}{4} \div 1 \frac{1}{4} =$ 3. $2 \frac{1}{9} \div 5 \frac{3}{7} =$
4. $16 \frac{1}{2} \div 12 =$ 5. $5 \frac{3}{4} \div \frac{1}{9} =$ 6. $\frac{3}{8} \div 1 \frac{2}{7} =$
7. $28 \div 2 \frac{4}{5} =$ 8. $11 \frac{5}{9} \div 7 \frac{1}{5} =$

SERIES IIADDITIONLEVEL C.

1. (a)	(b)	(c)	(d)	(e)
391	876	274.8	356.7	966
518	329	308.9	418.3	576
674	482	555.5	326.7	428
382	906	672.7	488.9	875
577	385	348.9	757.6	796
749	477	876.0	689.8	248
				987
(f)	(g)	(h)	(i)	(j)
874	\$87.56	\$29.67	875	391
266	49.38	42.54	329	462
329	75.99	87.65	465	518
786	56.64	64.98	734	779
493	68.77	96.32	289	684
808	34.85	50.77	651	589
787			339	976
			417	387

(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{2} \times 6$	$\frac{1}{3} \times 9$	$\frac{2}{5} \times 4$	$\frac{3}{7} \times 5$	$\frac{4}{9} \times 8$	$\frac{5}{11} \times 7$
$\frac{1}{2} \times 6$	$\frac{1}{3} \times 9$	$\frac{2}{5} \times 4$	$\frac{3}{7} \times 5$	$\frac{4}{9} \times 8$	$\frac{5}{11} \times 7$

PROBLEMS FOR PRACTICE

$$\begin{aligned}
 &= \frac{1}{2} \times 6 \div \frac{1}{3} \times 9 = 18 \\
 &= \frac{2}{5} \times 4 \div \frac{3}{7} \times 5 = 10 \\
 &= \frac{3}{7} \times 5 \div \frac{4}{9} \times 8 = 12 \\
 &= \frac{4}{9} \times 8 \div \frac{5}{11} \times 7 = 14
 \end{aligned}$$

PROBLEMS FOR PRACTICE

(1)	(2)	(3)	(4)	(5)
100	7.50	4.50	100	100
200	7.50	9.00	200	200
300	7.50	13.50	300	300
400	7.50	18.00	400	400
500	7.50	22.50	500	500
600	7.50	27.00	600	600
700	7.50	31.50	700	700
800	7.50	36.00	800	800
900	7.50	40.50	900	900
1000	7.50	45.00	1000	1000

(1)	(2)	(3)	(4)	(5)
100	7.50	4.50	100	100
200	7.50	9.00	200	200
300	7.50	13.50	300	300
400	7.50	18.00	400	400
500	7.50	22.50	500	500
600	7.50	27.00	600	600
700	7.50	31.50	700	700
800	7.50	36.00	800	800
900	7.50	40.50	900	900
1000	7.50	45.00	1000	1000

(k)	(l)	(m)	(n)	(o)
67.98	84.67	7894	9768	9.742
23.47	39.25	8267	4874	8.896
58.62	42.56	3549	5170	3.589
97.78	67.89	8186	7996	7.697
85.93	36.44	9247	3188	<u>5.068</u>
<u>39.24</u>	<u>58.28</u>	<u>3778</u>	<u>7846</u>	

(p)	(q)	(r)	(s)	(t)
3.906	8584	1896	6.	8612.41
5.485	9076	3488	2968.98	37.684
4.169	7828	9214	7.204	9.07
8.732	4954	8876	35.4	256.968
<u>7.848</u>	<u>8675</u>	<u>5943</u>	<u>9.88</u>	<u>46.5</u>
	<u>3190</u>	<u>6279</u>	<u>254.767</u>	<u>.04</u>

SERIES IISUBTRACTIONLEVEL C.

1. 643234 <u>203517</u>	2. 53246.3 <u>29307.4</u>	3. 4500423 <u>3126734</u>
4. 75025.2 <u>9714.4</u>	5. 6412804 <u>805349</u>	6. 6032.43 <u>2481.27</u>
7. 8648503 <u>78035</u>	8. 7804.36 <u>706.08</u>	9. 2401263 <u>1507837</u>
10. 4302136 <u>1708538</u>	11. 356.403 <u>128.238</u>	12. 5724.562 <u>123.456</u>
13. 8.0465 <u>3.27</u>	14. 193206 <u>8563</u>	

(0)	(07)	(08)	(12)	(13)
244.2	244.2	244.2	244.2	244.2
244.2	244.2	244.2	244.2	244.2
244.2	244.2	244.2	244.2	244.2
244.2	244.2	244.2	244.2	244.2
244.2	244.2	244.2	244.2	244.2

(14)	(15)	(16)	(17)	(18)
12.1100	12.1100	12.1100	12.1100	12.1100
200.70	200.70	200.70	200.70	200.70
70.0	70.0	70.0	70.0	70.0
200.70	200.70	200.70	200.70	200.70
3.31	3.31	3.31	3.31	3.31
20.0	20.0	20.0	20.0	20.0

1. 100%

2. 100%

3. 100%

244.2

244.2

244.2

244.2

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244.2

SERIES IIMULTIPLICATIONLEVEL C.

1. (a)	(b)	(c)	(d)	(e)
$\begin{array}{r} 628 \\ \times 705 \\ \hline \end{array}$	$\begin{array}{r} 625 \\ \times 404 \\ \hline \end{array}$	$\begin{array}{r} 7859 \\ \times 968 \\ \hline \end{array}$	$\begin{array}{r} 4685 \\ \times 157 \\ \hline \end{array}$	$\begin{array}{r} 7865 \\ \times 2500 \\ \hline \end{array}$
2. $\begin{array}{r} .75 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 1.20 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} .09 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 2.25 \\ \times 79 \\ \hline \end{array}$	$\begin{array}{r} 16.00 \\ \times 64 \\ \hline \end{array}$
3. $\begin{array}{r} 15.20 \\ \times 80 \\ \hline \end{array}$	$\begin{array}{r} .60 \\ \times 90 \\ \hline \end{array}$	$\begin{array}{r} .05 \\ \times 48 \\ \hline \end{array}$	$\begin{array}{r} 30.10 \\ \times 275 \\ \hline \end{array}$	$\begin{array}{r} 524 \\ \times .76 \\ \hline \end{array}$

SERIES IIDIVISIONLEVEL C.

1. $476 \overline{)423690}$	2. $3.84 \overline{)27.072}$	3. $306 \overline{)2144754}$
4. $7.65 \overline{)61.8885}$	5. $892 \overline{)300461}$	6. $.788 \overline{)4.79892}$
7. $487 \overline{)44.4144}$	8. $568 \overline{)3.33333}$	9. $987 \overline{)853632}$

MULTIPLICATION OF FRACTIONSLEVEL C.

1. $65 \times \frac{1}{2} =$	2. $\frac{5}{9} \times 6 \frac{3}{10} =$	3. $7 \frac{5}{8} \times 16 =$
4. $9 \frac{3}{5} \times 7 \frac{2}{9} =$	5. $4 \frac{1}{3} \times \frac{9}{39} =$	6. $4 \frac{2}{7} \times 3 \frac{2}{5} =$
7. $\frac{1}{3} \times \frac{3}{4} \times \frac{8}{9} =$	8. $11 \frac{1}{4} \times 4 \frac{4}{15} =$	

DIVISION OF FRACTIONSLEVEL C.

1. $25 \div 2 \frac{1}{2} =$	2. $6 \frac{1}{7} \div 8 \frac{3}{10} =$	3. $9 \frac{3}{8} \div 4 \frac{1}{6} =$
4. $72 \div 7 \frac{1}{10} =$	5. $22 \frac{1}{5} \div 14 \frac{12}{15} =$	6. $8 \frac{2}{7} \div \frac{10}{21} =$

1. 2. 3. 4. 5.

(1) 10.1
10.1

(2) 10.1
10.1

(3) 10.1
10.1

(4) 10.1
10.1

1. 2. 3. 4. 5.

(1) 10.1
10.1

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10.1

1. 2. 3. 4. 5.

1. 2. 3. 4. 5.

1. 2. 3. 4. 5.

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

10.1 10.1 10.1

1. 2. 3. 4. 5.

1. 2. 3. 4. 5.

$= 10.1 \times \frac{1}{10} = 1.01$

$= \frac{10.1}{10} = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

1. 2. 3. 4. 5.

1. 2. 3. 4. 5.

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$= \frac{1}{10} \times 10.1 = 1.01$

$$7. \quad 5 \frac{3}{4} \div \frac{1}{7} =$$

$$8. \quad 3 \frac{1}{16} \div 2 \frac{1}{10} =$$

SERIES I

PER CENT

- | | | | |
|--------|---|-------|----|
| A. (1) | 5% of 400 = | _____ | 1 |
| (2) | 33 $\frac{1}{3}$ % of 450 = | _____ | 2 |
| (3) | 10% of 52 = | _____ | 3 |
| (4) | 25% of 32 = | _____ | 4 |
| (5) | 50% of 1800 = | _____ | 5 |
| (6) | 87 $\frac{1}{2}$ % of 160 = | _____ | 6 |
| (7) | 37 $\frac{1}{2}$ % of 2400 = | _____ | 7 |
| (8) | 6% of \$1724 = | _____ | 8 |
| (9) | 4% of \$342 = | _____ | 9 |
| (10) | 8% of 1500 = | _____ | 10 |
| B. (1) | 3 is what per cent of 12? | _____ | 1 |
| (2) | 8 is what per cent of 16? | _____ | 2 |
| (3) | 14 is what per cent of 20? | _____ | 3 |
| (4) | 5 is what per cent of 100? | _____ | 4 |
| (5) | 8 is what per cent of 200? | _____ | 5 |
| (6) | 52 is what per cent of 156? | _____ | 6 |
| (7) | 48 is what per cent of 24? | _____ | 7 |
| (8) | 100 is what per cent of 20? | _____ | 8 |
| (9) | 250 is what per cent of 500? | _____ | 9 |
| (10) | \$35 is what per cent of \$75? | _____ | 10 |
| C. (1) | 5% of a number is 20. What is the number? | _____ | 1 |

- | | | | |
|------|--|-------|----|
| (2) | 33 $\frac{1}{3}\%$ of a number is 45. | _____ | 2 |
| | What is the number? | _____ | |
| (3) | 25% of a number is 100. What | _____ | |
| | is the number? | _____ | 3 |
| (4) | 10% of a number is 8. What is | _____ | |
| | the number? | _____ | 4 |
| (5) | 50% of a number is 17. What is | _____ | |
| | the number? | _____ | 5 |
| (6) | 66 $\frac{2}{3}\%$ of a number is 40. What | _____ | |
| | is the number? | _____ | 6 |
| (7) | 8% of an amount is \$16. What is | _____ | |
| | the required amount? | _____ | 7 |
| (8) | 15% of an amount is \$45. What is | _____ | |
| | the amount? | _____ | 8 |
| (9) | 75% of a length is 27 yd. What is | _____ | |
| | the required length? | _____ | 9 |
| (10) | 16 $\frac{2}{3}\%$ of a term is 1 year. What | _____ | |
| | is the term? | _____ | 10 |

DENOMINATE NUMBERS

A. ADD:

- | | | | | | |
|-----|--------------------|-----|---------------------|-----|---------------------|
| (1) | 2 ft. 4 in. | (2) | 3 ft. 6 in. | (3) | 6 ft. 5 in. |
| | <u>3 ft. 3 in.</u> | | <u>4 ft. 9 in.</u> | | <u>4 ft. 11 in.</u> |
| (4) | 2 qt. 1 pt. | (5) | 5 gal. 2 qt. | (6) | 9 gal. 3 qt. |
| | <u>3 qt. 1 pt.</u> | | <u>8 gal. 1 qt.</u> | | <u>2 gal. 2 qt.</u> |

$$\begin{array}{r} (7) \quad 13 \text{ cm. } 4 \text{ mm.} \\ \quad \underline{5 \text{ cm. } 7 \text{ mm.}} \\ \hline \end{array}$$

$$\begin{array}{r} (8) \quad 5 \text{ m. } 6 \text{ dm.} \\ \quad \underline{8 \text{ m. } 3 \text{ dm.}} \\ \hline \end{array}$$

$$\begin{array}{r} (9) \quad 3 \text{ sq.ft. } 95 \text{ sq.in.} \\ \quad \underline{5 \text{ sq.ft. } 65 \text{ sq.in.}} \\ \hline \end{array}$$

$$\begin{array}{r} (10) \quad 3 \text{ sq.yd. } 5 \text{ sq.ft.} \\ \quad \underline{5 \text{ sq.yd. } 7 \text{ sq.ft.}} \\ \hline \end{array}$$

B. SUBTRACT:

$$\begin{array}{r} (1) \quad 6 \text{ ft. } 9 \text{ in.} \\ \quad \underline{2 \text{ ft. } 3 \text{ in.}} \\ \hline \end{array}$$

$$\begin{array}{r} (2) \quad 5 \text{ ft. } 6 \text{ in.} \\ \quad \underline{2 \text{ ft. } 7 \text{ in.}} \\ \hline \end{array}$$

$$\begin{array}{r} (3) \quad 4 \text{ ft.} \\ \quad \underline{2 \text{ ft. } 7 \text{ in.}} \\ \hline \end{array}$$

$$\begin{array}{r} (4) \quad 3 \text{ qt. } 1 \text{ pt.} \\ \quad \underline{2 \text{ qt. } 1 \text{ pt.}} \\ \hline \end{array}$$

$$\begin{array}{r} (5) \quad 16 \text{ qt. } 1 \text{ pt.} \\ \quad \underline{9 \text{ qt.}} \\ \hline \end{array}$$

$$\begin{array}{r} (6) \quad 6 \text{ gal. } 2 \text{ qt.} \\ \quad \underline{4 \text{ gal. } 3 \text{ qt.}} \\ \hline \end{array}$$

$$\begin{array}{r} (7) \quad 8 \text{ km. } 900 \text{ m.} \\ \quad \underline{5 \text{ km. } 750 \text{ m.}} \\ \hline \end{array}$$

$$\begin{array}{r} (8) \quad 15 \text{ yd. } 1 \text{ ft.} \\ \quad \underline{6 \text{ yd. } 2 \text{ ft.}} \\ \hline \end{array}$$

$$\begin{array}{r} (9) \quad 10 \text{ lb. } 6 \text{ oz.} \\ \quad \underline{4 \text{ lb. } 9 \text{ oz.}} \\ \hline \end{array}$$

$$\begin{array}{r} (10) \quad 4 \text{ sq.yd.} \\ \quad \underline{2 \text{ sq.yd. } 3 \text{ sq.ft.}} \\ \hline \end{array}$$

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

• 22. 22. 22 (10)
• 22. 22. 22

APPENDIX B

INSTRUCTIONS AND SUGGESTIONS FOR TEACHERS OF REMEDIAL ARITHMETIC CLASSES

TO TEACHERS OF REMEDIAL ARITHMETIC CLASSES

Following are some suggested procedures for your remedial arithmetic classes, but feel free to use your own ideas. If you let me know briefly after the classes are over, what plans you did follow, I would appreciate it very much. Since the remedial classes are concentrating on the fundamental computational skills, various practise and drill methods will be followed. Before you use each of the practise exercises supplied, you will likely have a few minutes of "warming up" by means of mental arithmetic, flash cards, visualization, etc. and a short discussion period wherein you try to gain the confidence of the pupils and to have them talk about difficulties they have in the particular skill. As pupils do the practise exercises, you will want to keep them working under a bit of pressure (timing, etc.) for best results.

When most have finished, let the pupils check their own answers as you read them from the key. Encourage them to keep records of their own work, but assure them that this class is purely for giving help, and that no records will be kept by you on results of practice, for reports or records.

Maybe you would like to know in what sequence I plan to present the practise exercises on the basis of two periods a week:

THE HISTORY OF THE UNITED STATES

CHAPTER I. THE DISCOVERY OF AMERICA.

It is a well-known fact, that the discovery of America was made by Christopher Columbus, in the year 1492.

At that time, the world was divided into two parts, the East and the West.

The East was the part of the world which was known to the ancients, and the West was the part which was unknown to them.

It was not until the year 1492, that the West was discovered by Christopher Columbus.

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It was not until the year 1492, that the West was discovered by Christopher Columbus.

First week - Addition	(1)	Series 1 Level A
	(2)	Series 1 Level B
Second week - Subtraction	(1)	Series 1 Level A
	(2)	Series 1 Level B
Third week - Multiplication	(1)	Series 1 Level A
	(2)	Series 1 Level B
Fourth week - Division	(1)	Series 1 Level A
	(2)	Series 1 Level B
Fifth week - Addition	(1)	Series 2 Level A
	(2)	Series 2 Level B
Sixth week - Subtraction	(1)	Series 2 Level A
	(2)	Series 2 Level B
Seventh week - Multiplication	(1)	Series 2 Level A
	(2)	Series 2 Level B
Eighth week - Division	(1)	Series 2 Level A
	(2)	Series 2 Level B

The next eight weeks will be taken up with remedial reading classes, so the arithmetic program will recess.

Ninth week - Addition of Fractions	(1)	Level A
	(2)	Level B
Tenth week - Subtraction of Fractions	(1)	Level A
	(2)	Level B
Eleventh week - Multiplication of Fractions	(1)	Level A
	(2)	Level B
Division of Fractions	(2)	Level A

- Twelfth week - Addition (1) Series 1 Level C
 Subtraction (2) Series 1 Level C
- Thirteenth week - (1) Multiplication Series 1 Level C
 (2) Division Series 1 Level C
- Fourteenth week (1) Addition of Fractions Level C
 (2) Subtraction of Fractions Level C
- Fifteenth week (1) Multiplication of Fractions
 Level B
 (2) Division of Fractions Level B
- Sixteenth week (1) (a) Addition Series 2 Level C
 (b) Subtraction Series 2 Level C
 (2) (a) Multiplication Series 2
 Level C
 (b) Division Series 2 Level C

Also plan to fit in: Multiplication of Fractions Level C, Division of Fractions Level C, Per cent practice, and Addition and Subtraction of Denominate Numbers.

Finally, after a three week interval (no arithmetic remedial classes) give the Form K Stanford Advanced test in Arithmetic Computation. Then return the tests and answer sheets to Mr. Conquest's office as soon as possible so we can compare results. Such analysis should be finished by the fall of 1957.

I thank you most sincerely for the help and co-operation you have given in this part of the study. Only through use of research methods under classroom conditions can we

get answers to many of our problems. I am sure at least some of you will be interested in carrying on similar research in the near future and if so, I will be very glad to work with you as you have done with me.

E.B. Lindberg, Garneau Junior High.

EDMONTON PUBLIC SCHOOL BOARD

September 21, 1956.

STANFORD ACHIEVEMENT TESTS

A limited testing program in arithmetic computation is being conducted in relation to the experimental course in reading-arithmetic which is in operation in some schools. It is felt that, not only will these test results be significant to teachers as an assessment of relative pupil ability in this field, but that they may lead to the development of city tests at the Junior High School level. You will be asked to administer Form K of this test during the spring term.

Mr. E.B. Lindberg of Garneau School is doing thesis work in relation to this topic and will be compiling information which will be sent to participating schools when it is available.

G.R. Conquest,

Assistant Superintendent of Secondary Schools.

INSTRUCTIONS TO TEACHERS (FORM J)

1. May this test be given to the grade eight classes in your school the week of September 24 or as soon after as possible. Keep a copy of the results for your records and possible use for report cards.
2. Let the students complete the information section of the answer sheet, and discuss the instructions with them in part of a class period preceding a test period. Allow students exactly thirty-three minutes for the test. Return all the printed Stanford tests along with the pupils' answer sheets to Mr. Conquest's office as soon as possible after the tests are complete.

EDMONTON PUBLIC SCHOOL BOARD
STANFORD ACHIEVEMENT TEST, GRADE VIII

March 1, 1957.

The limited testing program in arithmetic computation started last fall in relation to the experimental course in reading - arithmetic which is in operation in some schools is being continued this term. All the grade eight teachers of arithmetic at the schools taking part in this program are now being asked to administer Form K of the Stanford Achievement Test in arithmetic computation during the week of May 8. This will be about three weeks after the second eight-week period of special arithmetic classes is completed, and will thus allow for a short "forgetting" period before the 'k' test is given. It is felt that when results of this test are considered in conjunction with the results of Test J last fall, they will be significant to teachers as an assessment of pupil ability in this field. The over-all findings will be sent to participating schools when they are available.

G.R. Conquest,
Assistant Superintendent, Secondary Education.

THE HISTORY OF THE UNITED STATES

OF THE UNITED STATES OF AMERICA

1776-1876

The history of the United States is a story of the growth of a nation from a collection of colonies to a great republic. It is a story of the struggle for freedom and independence, of the fight for the rights of the oppressed, and of the development of a government that has become a model for the world. The story begins with the first settlers, who came to America in search of a better life. They found a land of opportunity, but they also found a land of conflict. The Native Americans, who had lived in the land for centuries, were the first to be conquered. The story continues with the struggle for independence, the fight for the rights of the oppressed, and the development of a government that has become a model for the world. The story ends with the present day, when the United States is a great and powerful nation, but still faces many challenges.

1776-1876

THE HISTORY OF THE UNITED STATES

INSTRUCTIONS TO TEACHERS (FORM K)

1. May this test be given to all grade VIII classes in your school the week of May 8. Keep a copy of the results for your records and possible use for report cards.
2. Let the students complete the information section of the answer sheet, and discuss the instructions with them in part of a class period preceding a test period. Allow students exactly thirty-three minutes for the test.
3. Return all the printed Stanford tests along with pupils' answer sheets to Mr. Conquest's office as soon as possible after the testing is complete.
4. At top of pupil's instruction page place the pupil's Laycock I.Q. in code in box:

For Office Use Only

INSTRUCTIONS TO EXAMINEES

1. Pay this test to those to all classes in your school the week of April 1. Use a copy of the test for your records and provide a copy for each examinee.

2. Let the examinee see the test and instructions before the answer sheet, and discuss the instructions with them. Let it be a closed book examination. Allow students exactly 1 hour - 15 minutes for the test.

3. Return all the answers promptly to the examinee's answer sheet to the examinee's office as soon as possible after the testing is complete.

4. At top of page 1 of the examination form place the examinee's name and code in box:

For Office Use Only

QUESTIONNAIRE
for
TEACHERS OF REMEDIAL MATHEMATICS CLASSES

To get information that will be of help in analyzing the success of the remedial mathematics courses, it is hoped that the teachers co-operating in the experiment will forward to Mr. Conquest's office, answers to the following questions as soon as possible after the year's program in that course is completed.

1. Name of teacher handling remedial mathematics course.

2. Grade taking the course _____
3. School _____
4. Number of pupils in remedial course. _____
5. Total number of pupils in this grade at your school.

6. How was the remedial class selected? _____

7. Did the remedial class take all the other subjects together? _____
8. Or -- were they together only for the remedial math?

9. How many periods a week were set aside for strictly remedial math work? _____
10. How many weeks were spent on the remedial math.
work? (Total) _____
11. Were these weeks continuous, or broken up? _____
12. If they were broken up (e.g. because of remedial reading) into what periods was this done? _____

13. How long was it between the time of stopping remedial math. instruction and the giving of Stanford Test K (Arith. Achievement)? _____
14. What practice materials, aids etc. did you use in the course? _____

15. What teaching methods did you use? (drill, "meaningful", practical application - teacher explains, teacher demonstrated, pupil activity etc.) _____

16. Were you able to give individual help? _____
17. If so, how? _____

18. Did you teach only the remedial math class? _____
19. Or did you also teach the regular math course? _____
20. What were you able to find out, or sense about pupils' response to the course? _____

21. Did you get any parents' reactions to the course? _____
22. If so, what was it? _____

23. If yours was a segregated class that took all other subjects together too, was it generally a weak class? _____

24. In such a case, will the number of grade failure, _____

1. The first was to secure the plan of the building.
2. The second was to secure the plan of the building.
3. The third was to secure the plan of the building.
4. The fourth was to secure the plan of the building.
5. The fifth was to secure the plan of the building.
6. The sixth was to secure the plan of the building.
7. The seventh was to secure the plan of the building.
8. The eighth was to secure the plan of the building.
9. The ninth was to secure the plan of the building.
10. The tenth was to secure the plan of the building.
11. The eleventh was to secure the plan of the building.
12. The twelfth was to secure the plan of the building.
13. The thirteenth was to secure the plan of the building.
14. The fourteenth was to secure the plan of the building.
15. The fifteenth was to secure the plan of the building.
16. The sixteenth was to secure the plan of the building.
17. The seventeenth was to secure the plan of the building.
18. The eighteenth was to secure the plan of the building.
19. The nineteenth was to secure the plan of the building.
20. The twentieth was to secure the plan of the building.

- be higher than in the other classes? _____
25. What are your ideas regarding this matter? _____

26. In your opinion, has the remedial course been worth-
while? _____
27. If so, from what viewpoint, and in what way? _____

28. If not, why not? _____

29. What other suggestions, ideas or feelings have you
regarding such remedial math courses in addition
to the regular math courses? _____

1. The first thing I did was to go to the bank and get some money out of my account. I had some money in there, but I didn't want to take it all out at once. I took out just enough to get me started.

2. Then I went to the store and bought some food. I had to buy a lot of things, but I didn't want to spend too much money. I bought some meat, some vegetables, and some fruit. I also bought some bread and some milk.

3. After that, I went to the post office and sent some letters. I had some letters that I had written, but I didn't have time to send them before. I sent them now, so they would get there in time.

4. Then I went to the library and borrowed some books. I had some books that I had read, but I didn't want to keep them. I borrowed some new books, so I could read them.

5. Finally, I went to the park and walked around. I had some time to spare, so I went to the park. I walked around the lake and saw some beautiful flowers. I also saw some children playing.

APPENDIX C

TESTS USED

STANFORD ACHIEVEMENT TEST

Advanced
Arithmetic Test

FORM
J

TRUMAN L. KELLEY • RICHARD MADDEN • ERIC F. GARDNER • LEWIS M. Terman • GILES M. RUCH

Advanced Arithmetic Test

Name _____ Age _____ Grade _____ Boy or girl _____

Teacher _____ School _____ Date of birth _____
Year Month Day

City or Town _____ State _____ Date _____

	1 ARITH. REAS.	2 ARITH. COMP.	AVER. ARITH.
Grade Equiv.			
Age Equiv.			
%-ile Rank			

Issued 1953 by World Book Company, Yonkers-on-Hudson, New York, and Chicago, Illinois
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TEST 1 *Arithmetic Reasoning* PART I

DIRECTIONS: Work an example, and then compare your answer with the answers which follow it. If your answer is one of those given, mark the answer space that has the same letter as your answer. Sometimes the correct answer is not given. If you do not find the correct answer, mark the space under the letter for **not given**.

SAMPLES: ⁵¹ How many balls are 3 balls and 4 balls?

a 3 b 4 c 7 d 12 e not given.....⁵¹ a b c d e

⁵² How many books are 3 books and 2 books?

f 2 g 3 h 4 i 6 j not given.....⁵² f g h i j

¹ Judy has 16 jacks and Hazel has 9. How many more jacks has Judy than Hazel?

a 7 b 9 c 16 d 25 e not given.....¹ a b c d e

² Mother bakes 24 rolls at a time. How many pans will she need if she bakes 6 in a pan?

f 4 g 18 h 24 i 30 j not given.....² f g h i j

³ A strip of paper 19 inches long is to be cut so that one piece will be a foot long. How long will the other piece be?

a 5 in. b 12 in. c 19 in. d 31 in. e not given.....³ a b c d e

⁴ A cake costs 73 cents. How much change will Mother get back if she gives the baker two half dollars?

f 23¢ g 27¢ h 37¢ i \$1.00 j not given.....⁴ f g h i j

⁵ A lock for the clubhouse will cost \$1.35. What will be each boy's share if 9 boys share equally?

a 9¢ b 14¢ c 15¢ d \$12.15 e not given.....⁵ a b c d e

⁶ Ruth weighs 78 pounds, Helen weighs 54, and Ann weighs 67. How many pounds will Ann have to gain to weigh as much as Ruth?

f 11 g 13 h 24 i 78 j not given.....⁶ f g h i j

⁷ Ann bought 6 yards of ribbon to tie two packages. For one package she used 3 yards and 2 feet. How much ribbon was left for the other package?

a 3 yd. b 3 yd. 1 ft. c 3 yd. 2 ft. d 9 yd. 2 ft. e not given.....⁷ a b c d e

⁸ You know how much a man is paid per hour. You know how many hours he worked in a week. To find his earnings for the week, what would you do?

f add g subtract h multiply i divide j not given.....⁸ f g h i j

⁹ How much would Steve get in all for selling 11 papers at 7¢ each and 3 magazines at 20¢ each?

a 27¢ b 77¢ c \$1.27 d \$1.37 e not given.....⁹ a b c d e

¹⁰ Each class in a school agreed to collect $\frac{1}{6}$ of 300 cans of food for Thanksgiving baskets. How many cans would each class have to collect?

f 50 g 60 h 180 i 240 j not given.....¹⁰ f g h i j

¹¹ Tom runs errands for 15¢ each. If he averages 15 errands a month, what is his monthly income?

a 15¢ b 30¢ c \$1.50 d \$2.25 e not given.....¹¹ a b c d e

¹² The heights of five boys are 60 inches, 67 inches, 66 inches, 62 inches, and 60 inches. If they lined up according to height, how tall would the middle boy be?

f 60 in. g 62 in. h 63 in. i 66 in. j not given.....¹² f g h i j

¹³ Candy eggs are 2 for 5¢. How many can be bought for 50¢?

a 10 b 20 c 25 d 30 e not given.....¹³ a b c d e

¹⁴ For a picnic, a class bought 4 dozen buns at 22¢ a dozen and 3 packages of marshmallows at 32¢ a package. How much did the buns and marshmallows cost all together?

f 88¢ g 96¢ h \$1.74 i \$1.84 j not given.....¹⁴ f g h i j

TEST 1 *Arithmetic Reasoning* (Continued)

- 5 When the Smiths go to the movies, Jane takes care of their baby and earns 50¢ an hour. How much should she receive for staying one evening from 7 P.M. to 10:30 P.M.?
 a 50¢ b \$1.50 c \$1.75 d \$2.50 e not given .15
- 6 A pancake recipe for 6 persons calls for $2\frac{1}{2}$ cups of pancake mix. How many cups will it take for 3 persons?
 f $1\frac{1}{4}$ g $1\frac{1}{2}$ h $2\frac{1}{2}$ i $3\frac{3}{4}$ j not given .16
- 7 Bill jumped 13 feet 5 inches on Tuesday. On Thursday he jumped 11 feet 9 inches. How much farther did he jump on Tuesday than on Thursday?
 a 1 ft. 2 in. b 1 ft. 4 in. c 1 ft. 6 in. d 2 ft. 4 in. e not given .17
- 8 A Scout troop bought 24 uniforms for \$194.40. What was the cost per uniform?
 f \$8.10 g \$8.95 h \$9.92 i \$9.95 j not given .18
- 9 Pine City is 120 miles from Milton. To go from Pine City to Milton by bus takes 4 hours and by train only $2\frac{3}{4}$ hours. How many hours less does it take to go by train?
 a $1\frac{1}{4}$ b $1\frac{3}{4}$ c $2\frac{1}{4}$ d $6\frac{3}{4}$ e not given .19
- 0 How many 1-inch by 2-inch pieces of candy can be cut in a pan which is 8 inches by 10 inches?
 f 20 g 36 h 50 i 80 j not given .20
- 1 Dan says there are 2 quart and 2 pint packages of ice cream for the party. How many people will all of it serve if a pint serves 4 people?
 a 4 b 12 c 16 d 24 e not given .21
- 2 A scale drawing reads "1 inch = 12 inches." A line $3\frac{1}{4}$ inches long on this drawing represents how many actual inches?
 f 12 g $15\frac{1}{4}$ h 27 i 39 j not given .22
- 3 The butcher says to cook a turkey 20 minutes for each pound. At what hour should a 15-pound turkey be started in order to be done at 12 o'clock noon?
 a 6 A.M. b 8 A.M. c 9 A.M. d 10 A.M. e not given .23
- 4 If campers start 2000 forest fires each year and tobacco smokers start 5000, how many times as many fires are started by tobacco smokers as by campers?
 f $\frac{2}{5}$ g $2\frac{1}{2}$ h 5 i 10 j not given .24
- 5 George wants to buy a board to saw into 8 pieces $1\frac{3}{4}$ feet long. If he ignores the waste in sawing, how long will the board have to be?
 a $9\frac{3}{4}$ ft. b 14 ft. c 16 ft. d 56 ft. e not given .25
- 6 Mr. Wilson is going to buy 60 pounds of mixed grass seed. He says the mixture should be 1 part clover, 2 parts bluegrass, and 3 parts rye. How many pounds of the mixture will be bluegrass seed?
 f 6 g 10 h 20 i 30 j not given .26
- 7 A club has an income of \$50. Of this, \$20 is budgeted for food. What per cent does the club budget for food?
 a 10 b 20 c 25 d 40 e not given .27
- 8 If the sales tax is 3%, what is the tax, to the nearest cent, on a coat which costs \$27.60?
 f 81¢ g 83¢ h 84¢ i 92¢ j not given .28
- 9 If a man earns \$80 in a week and has deductions of 1% for unemployment insurance, $1\frac{1}{2}$ % for old-age security, and \$12 for income tax, how much does he have left?
 a \$65.50 b \$66 c \$67.80 d \$67.97 e not given .29
- 0 The speed of sound is about 1100 feet per second. Bob sees lightning and then hears it thunder 20 seconds later. To the nearest mile, how many miles away was the lightning?
 f 4 g 6 h 8 i 10 j not given .30

TEST 1 *Arithmetic Reasoning* PART II

DIRECTIONS: The answer to each of these examples can be thought out without doing any figuring on paper. You are to think out the answer and mark the answer space that is lettered the same as your choice.

- 31 Without working the examples, choose the one in which the quotient will be largest.
 a $19\overline{)938}$ b $19\overline{)940}$ c $19\overline{)934}$ d $19\overline{)937}$ 31 a b c
- 32 In which number is the 8 in the hundreds position?
 e 1089 f 1980 g 9801 h 1908 32 e f g
- 33 Which is the smallest fraction?
 a $\frac{1}{10}$ b $\frac{1}{50}$ c $\frac{1}{100}$ d $\frac{1}{5}$ 33 a b c
- 34 Without measuring, tell how many inches long this line is. _____
 e 1 f 2 g 3 h 4 34 c f g
- 35 How much is 19.7 rounded off to the nearest whole number?
 a 19 b $19\frac{7}{10}$ c 20 d 197 35 a b c
- 36 A loan which has real estate to guarantee its payment is —
 e interest f stock g capital h a mortgage 36 e f g
- 37 A kind of insurance which protects against lawsuits for damage is —
 a annuity b liability c theft d marine 37 a b c
- 38 By estimation, choose the example which will have the smallest product.
 e $\frac{806}{4.50}$ f $\frac{8.06}{45.0}$ g $\frac{80.6}{4.50}$ h $\frac{8.06}{4.50}$ 38 e f g
- 39 $\sqrt{64} =$ a 8 b 32 c 64 d 4096 39 a b c
- 40 How much is 150% of 20?
 e 3 f 7.5 g 30 h 75 40 e f g
- 41 Which line is horizontal?
 a $\left| \right.$ b $/$ c \backslash d _____ 41 a b c
- 42 If b is the base of a triangle and a is its altitude, the area of the triangle is —
 e $\frac{1}{2}ab$ f ab g $a + b$ h $2ab$ 42 e f g
- 43 17.5% is equal to the decimal —
 a .175 b 1.75 c 17.05 d 17.50 43 a b c
- 44 By estimation, choose the example whose quotient will be smaller than 1.
 e $126\overline{)127}$ f $138\overline{)137.2}$ g $156.3\overline{)157}$ h $125\overline{)125}$... 44 e f g
- 45 Which is the same as "4 less than 5 times a number = 21"?
 a $4 - 5 = 21N$ b $\frac{5N}{4} = 21$ c $21 \times 5 - 4 = N$ d $5N - 4 = 21$ 45 a b c

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Gr. score	23	26	29	31	33	36	38	40	42	44	46	48	50	52	54	56	58	60	61	63	65	67	69	71	73	75	77	79	81	84	86	89	92	95	98	101	104	107	110	113	117	120	123	127	129

DIRECTIONS: Work each example. Then compare your answer with the answers given at the right of the example. If your answer is one of those given, mark the answer space that has the same letter as your answer. Sometimes the correct answer is not given. If the correct answer is not given, mark the answer space under the letter for not given. Look carefully at each example to see what it tells you to do. If you need to do any figuring, use a separate sheet of paper.

1 Multiply	$\begin{array}{r} 450 \\ 7 \\ \hline 47 \end{array}$	a 3050	b 3100	c 3150	d 3157	e not given	1	a	b	c	d	e
2 Add	$\begin{array}{r} \$4.80 \\ 9.65 \\ \hline \end{array}$	f \$13.45	g \$13.55	h \$14.55	i \$15.45	j not given	2	f	g	h	i	j
3 Subtract	$\begin{array}{r} \$5.00 \\ 4.48 \\ \hline \end{array}$	a \$.52	b \$.62	c \$1.48	d \$1.52	e not given	3	a	b	c	d	e
4	$43 \overline{)86}$	f 2	g 3	h 11	i 20	j not given	4	f	g	h	i	j
5 Add	$\begin{array}{r} 854 \\ 759 \\ 47 \\ 36 \\ \hline \end{array}$	a 1686	b 1696	c 1706	d 1796	e not given	5	a	b	c	d	e
6 Multiply	$\begin{array}{r} 75 \\ 14 \\ \hline \end{array}$	f 89	g 1010	h 1040	i 10,520	j not given	6	f	g	h	i	j
7 Subtract	$\begin{array}{r} 871,653 \\ 396,785 \\ \hline \end{array}$	a 474,868	b 475,868	c 484,968	d 485,868	e not given	7	a	b	c	d	e
8	$34 \overline{)748}$	f $19 \frac{2}{34}$	g 22	h $24 \frac{15}{17}$	i 112	j not given	8	f	g	h	i	j
9 Multiply	$\begin{array}{r} 310 \\ 203 \\ \hline \end{array}$	a 613	b 7130	c 62,930	d 64,960	e not given	9	a	b	c	d	e
10 Subtract	$\begin{array}{r} 8 \frac{1}{10} \\ 7 \frac{5}{6} \\ \hline \end{array}$	f $1 \frac{4}{15}$	g $1 \frac{7}{10}$	h $1 \frac{14}{15}$	i $15 \frac{14}{15}$	j not given	10	f	g	h	i	j
11 Add	$\frac{1}{6} + \frac{1}{6}$	a $\frac{1}{12}$	b $\frac{1}{3}$	c 1	d 2	e not given	11	a	b	c	d	e
12	$\frac{1}{4} \times \frac{3}{4} =$	f $\frac{1}{4}$	g $\frac{1}{3}$	h $\frac{3}{8}$	i $\frac{3}{4}$	j not given	12	f	g	h	i	j
13	$6 \div \frac{2}{5} =$	a $\frac{1}{15}$	b $\frac{3}{5}$	c 3	d 15	e not given	13	a	b	c	d	e
14	4% of \$800 =	f \$32	g \$200	h \$320	i \$804	j not given	14	f	g	h	i	j
15 Add	$\begin{array}{r} \frac{3}{4} \\ \frac{1}{3} \\ 2 \frac{1}{2} \\ \hline \end{array}$	a $2 \frac{1}{6}$	b $2 \frac{5}{12}$	c $3 \frac{1}{6}$	d $3 \frac{1}{2}$	e not given	15	a	b	c	d	e

16 $.2 \times .12 =$ *f* .024 *g* .06 *h* .6 *i* 24 *j* not given.....16 *f* *g* *h* *i* *j*

17 Add $\begin{array}{r} 4474.59 \\ 7668.98 \\ 90.67 \\ \hline 698.56 \end{array}$ *a* 12,022.80 *b* 12,822.90 *c* 12,931.80 *a* *b* *c* *d* *e*
d 12,932.80 *e* not given.....17 *d* *e*

18 $6\overline{)5424}$ *f* 84 *g* 94 *h* 904 *i* 940 *j* not given.....18 *f* *g* *h* *i* *j*

19 Selling Price = \$250 *a* \$10 *b* \$100 *c* \$240 *d* \$254 *a* *b* *c* *d* *e*
Rate of Commission = 4% *e* not given.....19 *e*
Commission = ?

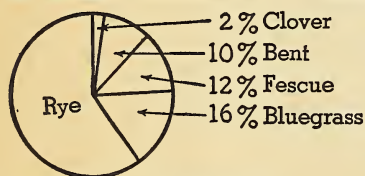
20 $8\overline{)16}$ *f* .002 *g* .2 *h* 2 *i* 20 *j* not given.....20 *f* *g* *h* *i* *j*

21 Subtract $\begin{array}{r} 3\frac{2}{3} \\ 3\frac{1}{5} \\ \hline \end{array}$ *a* 0 *b* $\frac{1}{3}$ *c* $\frac{7}{15}$ *d* $6\frac{13}{15}$ *e* not given.....21 *a* *b* *c* *d* *e*

22 $4\frac{2}{3} \times 3\frac{3}{4} =$ *f* $7\frac{1}{2}$ *g* 12 *h* $12\frac{1}{2}$ *i* 15 *j* not given.....22 *f* *g* *h* *i* *j*

23 If $d + 5 = 15$, $d =$ *a* 3 *b* 10 *c* 20 *d* 75 *e* not given.....23 *a* *b* *c* *d* *e*

24 $\frac{5}{8} \div \frac{3}{10} =$ *f* $\frac{3}{16}$ *g* $\frac{4}{9}$ *h* $\frac{12}{25}$ *i* $2\frac{1}{12}$ *j* not given.....24 *f* *g* *h* *i* *j*



A Grass Seed Mixture

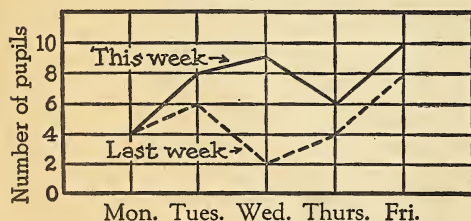
25 What per cent of the grass seed is rye? *a* 38% *b* 40% *c* 60% *d* 62% *a* *b* *c* *d* *e*
e not given.....25 *e*

26 How many times as much bluegrass is there as clover? *f* 2 *g* 8 *h* 16 *i* 18 *j* not given.....26 *f* *g* *h* *i* *j*

27 Subtract $\begin{array}{r} 11 \text{ ft. } 4 \text{ in.} \\ 8 \text{ ft. } 8 \text{ in.} \\ \hline \end{array}$ *a* 2 ft. 6 in. *b* 2 ft. 8 in. *c* 3 ft. 4 in. *a* *b* *c* *d* *e*
d 20 ft. 0 in. *e* not given.....27 *d* *e*

28 Add $\begin{array}{r} 4 \text{ hr. } 27 \text{ min.} \\ 4 \text{ hr. } 36 \text{ min.} \\ 3 \text{ hr. } 38 \text{ min.} \\ \hline \end{array}$ *f* 11 hr. 41 min. *g* 12 hr. 1 min. *h* 12 hr. 31 min. *f* *g* *h* *i* *j*
i 12 hr. 51 min. *j* not given.....28 *i* *j*

NUMBER OF PUPILS ABSENT DURING A TWO-WEEK PERIOD

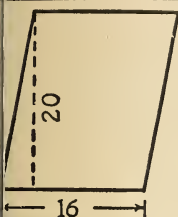


29 On which day of these two weeks were the most pupils absent? *a* Tues. *b* Wed. *c* Thurs. *d* Fri. *a* *b* *c* *d* *e*
e not given.....29 *e*

30 How many more pupils were absent on Wednesday of this week than on Thursday of last week? *f* 2 *g* 5 *h* 6 *i* 9 *j* not given 30 *f* *g* *h* *i* *j*

31 Find the average $\begin{array}{r} 16 \text{ ft.} \\ 32 \text{ ft.} \\ \hline 12 \text{ ft.} \end{array}$ *a* 12 ft. *b* $12\frac{1}{2}$ ft. *c* 16 ft. *d* 20 ft. *e* not given 31 *a* *b* *c* *d* *e*

2	$.4\overline{)3}$	$f .075$	$g \frac{3}{4}$	$h .75$	$i 7.5$	j not given.....	32	f	g	h	i	j
3	Add $\frac{21 \text{ m. } 66 \text{ cm.}}{32 \text{ m. } 72 \text{ cm.}}$	$a \frac{53 \text{ m. } 38 \text{ cm.}}{d 66 \text{ m. } 8 \text{ cm.}}$	$b \frac{54 \text{ m. } 38 \text{ cm.}}{e}$ not given.....	$c \frac{65 \text{ m. } 8 \text{ cm.}}{33}$	a	b	c	d	e			



34	If $A = bh$, what is the area of the parallelogram shown at the left?	$f 32$	$g 36$	$h 160$	$i 1620$	j not given.....	34	f	g	h	i	j
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5	If 10% of an amount is 25¢, what is the amount?	$a 2.5¢$	$b 25¢$	$c 40¢$	$d \$2.50$	e not given.....	35	a	b	c	d	e
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6	$\frac{2}{6} = \frac{1}{?}$	$f 3$	$g 5$	$h 7$	$i 12$	j not given.....	36	f	g	h	i	j
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7	If $5r + 2 = 37$, $r =$	$a 5$	$b 7$	$c 30$	$d 35$	e not given.....	37	a	b	c	d	e
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8	Assessed Valuation = \$2000 Tax Rate per \$100 = \$4.50 Amount of Tax = ?	$f \$9$	$g \$15.50$	$h \$90$	$i \$2450$	j not given.....	38	f	g	h	i	j
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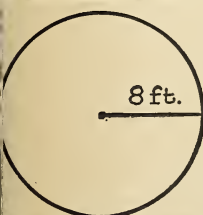
9	$\frac{-24}{-3} =$	$a -24$	$b -8$	$c 8$	$d 21$	e not given.....	39	a	b	c	d	e
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0	Multiply $\frac{-3y}{-4}$	$f 12y$	$g -12y$	$h 12$	$i -12$	j not given.....	40	f	g	h	i	j
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1	Principal = \$400 Annual Interest = \$20 Rate of Interest = ?	$a .4\%$	$b 2\%$	$c 5\%$	$d 40\%$	e not given.....	41	a	b	c	d	e
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2	If $\frac{B}{2} = 16$, $B =$	$f 14$	$g 16$	$h 18$	$i 32$	j not given.....	42	f	g	h	i	j
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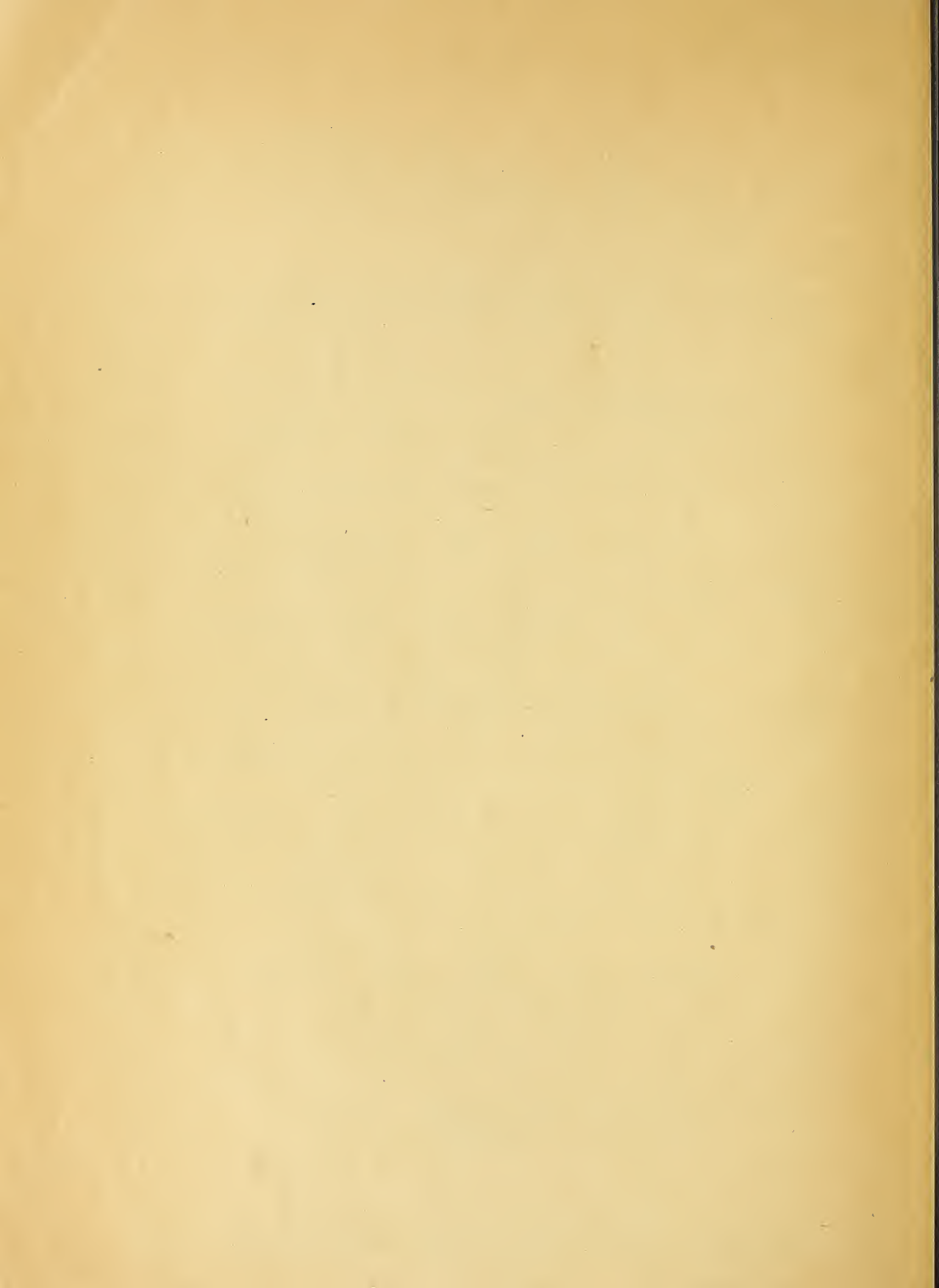
3	Principal = \$400 Rate = 3% Time = 9 mo. Interest = ?	$a \$1.33$	$b \$9$	$c \$12$	$d \$108$	e not given.....	43	a	b	c	d	e
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44	If $A = \pi r^2$, what is the area of the circle shown at the left? ($\pi = 3.14$)	$f 24.12 \text{ sq. ft.}$	$g 50.24 \text{ sq. ft.}$	$h 198.24 \text{ sq. ft.}$	$i 200.96 \text{ sq. ft.}$	j not given.....	44	f	g	h	i	j
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Stop.

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Gr. score	21	28	31	33	35	38	40	43	45	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	74	76	78	79	81	84	86	89	92	96	100	104	107	111	114	117	120	123	126	129



STANFORD ACHIEVEMENT TEST

TRUMAN L. KELLEY • RICHARD MADDEN • ERIC F. GARDNER • LEWIS M. TERMAN • GILES M. RUCH

Advanced Arithmetic Test

Name _____ Age _____ Grade _____ Boy or girl _____

Teacher _____ School _____ Date of birth _____
Year Month Day

City or town _____ State _____ Date _____

	1 ARITH. REAS.	2 ARITH. COMP.	AVER. ARITH.
Grade Equiv.			
Age Equiv.			
%-ile Rank			

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TEST 1 *Arithmetic Reasoning* PART I

← 2

DIRECTIONS: Work an example, and then compare your answer with the answers which follow it. If your answer is one of those given, mark the answer space that has the same letter as your answer. Sometimes the correct answer is not given. If you do not find the correct answer, mark the space under the letter for **not given**.

SAMPLES: ⁵¹ How many balls are 3 balls and 4 balls?

a 3 b 4 c 7 d 12 e not given.....⁵¹ f g h i j

⁵² How many books are 3 books and 2 books?

f 2 g 3 h 4 i 6 j not given.....⁵² f g h i j

¹ Steve got 38 addition examples and 24 subtraction examples right. How many examples were right all together?

a 14 b 24 c 38 d 62 e not given.....¹ f g h i j

² Ruth has 24 lines to learn for the play. She says she will learn 4 new ones every day. At that rate, how many days will it take to learn all 24 lines?

f 4 g 6 h 8 i 24 j not given.....² f g h i j

³ The school library has 24 shelves. Sue counted 34 books on one shelf. If each shelf has the same number of books, how many books are there all together?

a 24 b 34 c 58 d 716 e not given.....³ f g h i j

⁴ A coat which was priced at \$49.50 last month is now on sale for \$39.95. How much can be saved by buying at the sale price?

f \$9.55 g \$10.45 h \$10.55 i \$39.95 j not given.....⁴ f g h i j

⁵ Jane reads 15 pages in her book in 45 minutes. That is an average of how many minutes per page?

a 1 b 3 c 15 d 30 e not given.....⁵ f g h i j

⁶ Tom washes windows for 35¢ each. How much should he get for washing 12 of Mrs. Brown's windows?

f 35¢ g 52¢ h \$2.80 i \$4.20 j not given.....⁶ f g h i j

⁷ The children saw three kinds of planes at the airport. One could go 400 miles per hour, another 250, and another 125. What was the difference in miles per hour between the fastest and the slowest plane?

a 125 b 150 c 275 d 400 e not given.....⁷ f g h i j

⁸ Mother bought 8 cards at 10¢ each and 23 stamps at 3¢ each. How much did all the cards and stamps cost?

f \$1.39 g \$1.46 h \$1.49 i \$1.59 j not given.....⁸ f g h i j

⁹ Father bought 2 tickets at 87¢ each and 2 at 36¢ each. How much change should he get back from \$5?

a \$1.23 b \$2.46 c \$2.54 d \$3.77 e not given.....⁹ f g h i j

¹⁰ Helen has 24 hens. She gathered 18 eggs on Monday, 16 on Tuesday, and 19 on Wednesday. How many eggs did she gather on all 3 days?

f 53 g 54 h 63 i 77 j not given.....¹⁰ f g h i j

¹¹ Small cakes are 2 for 15¢. How many cakes will 45¢ buy?

a 2 b 3 c 15 d 30 e not given.....¹¹ f g h i j

¹² The scale on a map reads 1 inch = 50 miles. How many miles are represented by a line $3\frac{1}{2}$ inches long?

f 50 g 125 h 175 i 350 j not given.....¹² f g h i j

¹³ You know what you paid for a hat. You know how much money you had left. To find how much money you had before buying the hat, you would —

a add b subtract c multiply d divide e not given.....¹³ f g h i j

¹⁴ Dan is buying $1\frac{1}{4}$ pounds of large nails and 5 ounces of small nails. How many pounds of nails is he buying all together?

f 1 lb. 6 oz. g 1 lb. 10 oz. h $1\frac{3}{4}$ lb. i $2\frac{1}{2}$ lb. j not given.....¹⁴ f g h i j

EST 1 *Arithmetic Reasoning* (Continued)

- 5 Mary picked 2 boxes of berries in a quarter of an hour. How many boxes would she pick in an hour at that rate? *a* 2 *b* 4 *c* 6 *d* 8 *e* not given.....15
- 6 Some girls plan to make 16 pounds of candy for a candy sale. How many cups of sugar will it take if $1\frac{1}{4}$ cups are needed for each pound of candy? *f* 4 *g* 16 *h* $17\frac{1}{4}$ *i* 20 *j* not given.....16
- 7 A picture which is 2 inches by 3 inches is to be enlarged to 6 inches by 9 inches. Either dimension of the new picture will be how many times as large as the same dimension of the first picture? *a* 2 *b* 3 *c* 6 *d* 9 *e* not given.....17
- 8 If Ted's horse goes at the rate of $4\frac{3}{4}$ miles an hour, how many miles will it go in 4 hours? *f* $4\frac{3}{4}$ *g* 16 *h* 17 *i* 19 *j* not given.....18
- 9 Anne can play for three quarters of an hour. How many minutes is that? *a* 30 *b* 40 *c* 45 *d* 60 *e* not given.....19
- 10 Don spends $\frac{1}{2}$ of his allowance for clothes and $\frac{1}{4}$ for pleasure, and saves the rest. What fraction of his allowance does he save? *f* $\frac{1}{4}$ *g* $\frac{1}{2}$ *h* $\frac{3}{4}$ *i* $\frac{4}{4}$ *j* not given.....20
- 11 Bob's parents are planning to buy a new freezing cabinet. The storage space in the cabinet is 2 feet by 3 feet by $2\frac{1}{2}$ feet. How many cubic feet is that? *a* 6 *b* $7\frac{1}{2}$ *c* 12 *d* 14 *e* not given.....21
- 12 Mr. Smith's budget for his car this year is \$800. If his gasoline costs \$200, what per cent of his total budget for the car is used for gasoline? *f* 16 *g* 20 *h* 25 *i* 60 *j* not given.....22
- 13 A carpenter started work at 8:00 A.M. and stopped at 4:30 P.M., with $\frac{3}{4}$ hour off for lunch. How many hours did he work, to the nearest quarter hour? *a* $7\frac{3}{4}$ *b* 8 *c* $8\frac{1}{4}$ *d* $8\frac{1}{2}$ *e* not given.....23
- 14 What is the volume in cubic feet of a corncrib which is 8 feet wide, 30 feet long, and 10 feet high? *f* 240 *g* 380 *h* 760 *i* 2400 *j* not given.....24
- 15 Some children had fun measuring the length of their room with their own feet. Jane says it is 36 of her feet, but her feet are only 10 inches long. How many feet long is the room if measured by 12-inch feet? *a* 24 *b* 26 *c* 32 *d* 48 *e* not given.....25
- 16 If a sales tax is 3% what will the tax be to the nearest cent on a dress which costs \$12.90? *f* 43¢ *g* 39¢ *h* 38¢ *i* 36¢ *j* not given.....26
- 17 Last week, the workers in a factory made an average of 80 radios per day. This week, their gain the first day over the average of 80 is represented by +6. The second day, their loss was represented by -4. Gains and losses for the other three days were +2, -3, and -8. What is the total difference in production for the two weeks? *a* -15 *b* -7 *c* +8 *d* +23 *e* not given.....27
- 18 A candy bar which weighs $1\frac{1}{3}$ ounces sells for 10¢. At this rate, what does the candy cost per pound? *f* 13¢ *g* \$1.20 *h* \$1.33 *i* \$2.13 *j* not given.....28
- 19 The premium for a 1-year fire insurance policy is 40¢ per \$100 of insurance. A 3-year policy can be purchased for $2\frac{1}{2}$ times the cost of a 1-year policy. How much would the premium be on a 3-year policy for \$12,000? *a* \$48 *b* \$100 *c* \$120 *d* \$144 *e* not given.....29
- 20 A worker receives \$100 for a regular week of five 8-hour days, time and a half for Saturday, and double time for Sunday. This week he worked regularly on Monday through Friday, 4 hours on Saturday, and 2 hours on Sunday. How much did he earn all together? *f* \$110 *g* \$115 *h* \$120 *i* \$135 *j* not given.....30

TEST 1 *Arithmetic Reasoning* PART II

DIRECTIONS: The answer to each of these examples can be thought out without doing any figuring on paper. You are to think out the answer and mark the answer space that is lettered the same as your choice.

- 31 Which is the largest? *a* $\frac{1}{10}$ *b* $\frac{1}{40}$ *c* $\frac{1}{50}$ *d* $\frac{1}{20}$ 31 *a* *b* *c*
- 32 Which of these indicates temperature?
 e lb. *f* ° *g* '' *h* ' 32 *e* *f* *g*
- 33 By estimation, tell which of these examples will have the largest quotient.
 a $82\overline{)4136}$ *b* $69\overline{)4136}$ *c* $80\overline{)4136}$ *d* $71\overline{)4136}$ 33 *a* *b* *c*
- 34 Which of these months has just 30 days?
 e June *f* August *g* December *h* January 34 *e* *f* *g*
- 35 $2\frac{1}{2} =$ *a* 2.50 *b* $2.00\frac{1}{2}$ *c* $.2\frac{1}{2}$ *d* $.002\frac{1}{2}$ 35 *a* *b* *c*
- 36 The highest per cent of an average family's income should be budgeted for —
 e health *f* clothes *g* auto expenses *h* food 36 *e* *f* *g*
- 37 What is the $\sqrt{9}$? *a* 3 *b* 9 *c* 18 *d* 81 37 *a* *b* *c*
- 38 When a salesman receives a part of the selling price for his work, it is called his —
 e profit *f* commission *g* net income *h* expenses 38 *e* *f* *g*
- 39 How much is 7 hr. 50 min. rounded off to the nearest half hour?
 a 7 hr. *b* $7\frac{1}{2}$ hr. *c* 8 hr. *d* $8\frac{1}{2}$ hr. 39 *a* *b* *c*
- 40 Which number is nearest in value to one million?
 e 1,100,000 *f* 1,090,000 *g* 990,000 *h* 909,000 40 *e* *f* *g*
- 41 By estimation, choose the example which will have the largest product.
 a $\begin{array}{r} 8006 \\ \times 99 \\ \hline \end{array}$ *b* $\begin{array}{r} 8096 \\ \times 99 \\ \hline \end{array}$ *c* $\begin{array}{r} 8106 \\ \times 99 \\ \hline \end{array}$ *d* $\begin{array}{r} 8016 \\ \times 99 \\ \hline \end{array}$ 41 *a* *b* *c*
- 42 Which of these formulas would be used in borrowing money?
 e $v = lwh$ *f* $d = rt$ *g* $a = lw$ *h* $i = prt$ 42 *e* *f* *g*
- 43 What part of a circle is 1 degree?
 a $\frac{1}{60}$ *b* $\frac{1}{90}$ *c* $\frac{1}{100}$ *d* $\frac{1}{360}$ 43 *a* *b* *c*
- 44 Which is the same as "14 less than a number = 36"?
 e $36 - 14 = N$ *f* $\frac{N}{14} = 36$ *g* $N - 14 = 36$ *h* $N = 36 - 14$ 44 *e* *f* *g*
- 45 The amount of real estate tax to pay is the product of the tax rate times the —
 a real value *b* cost *c* taxable income
 d assessed valuation 45 *a* *b* *c*

Stop.

NO. RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Gr. score	23	26	29	31	33	36	38	40	42	44	46	48	50	52	53	55	57	59	60	61	63	65	67	68	70	72	74	76	79	81	84	86	90	93	96	99	104	107	110	113	117	120	123	127	129

TEST 2 *Arithmetic Computation*

DIRECTIONS: Work each example. Then compare your answer with the answers given at the right of the example. If your answer is one of those given, mark the answer space that has the same letter as your answer. Sometimes the correct answer is not given. If the correct answer is not given, mark the answer space under the letter for not given. Look carefully at each example to see what it tells you to do. If you need to do any figuring, use a separate sheet of paper.

1 Multiply	$\begin{array}{r} 504 \\ 4 \end{array}$	a 516	b 2016	c 2046	d 2056	e not given1	a	b	c	d	e
2 Add	$\begin{array}{r} \$3.76 \\ 6.50 \end{array}$	f \$9.26	g \$10.36	h \$11.16	i \$11.26	j not given 2	f	g	h	i	j
3 Subtract	$\begin{array}{r} \$7.00 \\ 6.48 \end{array}$	a \$.52	b \$.62	c \$1.42	d \$1.48	e not given3	a	b	c	d	e
4	$32 \overline{)64}$	f 2	g 3	h 11	i 20	j not given4	f	g	h	i	j
5 Add	$\begin{array}{r} 67 \\ 538 \\ 47 \\ 434 \end{array}$	a 976	b 986	c 1086	d 1186	e not given5	a	b	c	d	e
6 Multiply	$\begin{array}{r} 86 \\ 61 \end{array}$	f 147	g 486	h 5146	i 5246	j not given6	f	g	h	i	j
7 Subtract	$\begin{array}{r} 996,092 \\ 597,356 \end{array}$	a 398,736	b 400,636	c 400,736	d 409,336	e not given7	a	b	c	d	e
8	$13 \overline{)416}$	f $30 \frac{3}{13}$	g 32	h $32 \frac{10}{13}$	i $39 \frac{9}{13}$	j not given8	f	g	h	i	j
9 Multiply	$\begin{array}{r} 403 \\ 20 \end{array}$	a 806	b 860	c 8060	d 8260	e not given9	a	b	c	d	e
10 Subtract	$\begin{array}{r} 3\frac{5}{6} \\ \underline{1\frac{1}{6}} \end{array}$	f $2\frac{2}{3}$	g 3	h $3\frac{2}{3}$	i 4	j not given10	f	g	h	i	j
11 Add	$\begin{array}{r} 7\frac{1}{4} \\ 2\frac{7}{8} \end{array}$	a $9\frac{1}{8}$	b $9\frac{2}{3}$	c 10	d $10\frac{1}{8}$	e not given11	a	b	c	d	e
12	$\frac{4}{7} \times \frac{2}{3} =$	f $\frac{8}{21}$	g $\frac{3}{5}$	h $\frac{6}{7}$	i $1\frac{1}{7}$	j not given12	f	g	h	i	j
13	$2\frac{1}{3} \div 4 =$	a $\frac{1}{6}$	b $\frac{1}{2}$	c $2\frac{1}{2}$	d $6\frac{1}{3}$	e not given13	a	b	c	d	e
14	20% of \$75 =	f $\$3\frac{3}{4}$	g \$15	h \$95	i \$150	j not given14	f	g	h	i	j
15 Add	$\begin{array}{r} 4\frac{3}{5} \\ \frac{1}{4} \\ 3\frac{1}{4} \end{array}$	a $7\frac{1}{10}$	b $7\frac{3}{5}$	c 8	d $8\frac{3}{5}$	e not given15	a	b	c	d	e

TEST 2 *Arithmetic Computation* (Continued)

◀ 6

16 $.5 \times .07 =$ f .035 g .35 h 3.50 i 35 j not given16 f g h i j

17 Add $\begin{array}{r} 7835.73 \\ 85.56 \\ 9648.98 \\ 6693.75 \end{array}$ a 24,154.02 b 24,263.92 c 24,264.02 d 24,363.02 e not given17 a b c d e

18 $5\overline{)4025}$ f 85 g 805 h 825 i 850 j not given18 f g h i j

19 Selling Price = \$500
Rate of Commission = 8% a \$4.00 b \$5.08 c \$400 d \$460
Commission = ? e not given19 a b c d e

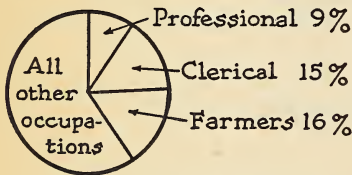
20 $5\overline{)0.020}$ f .004 g .04 h .4 i 4 j not given20 f g h i j

21 Subtract $\begin{array}{r} 6\frac{1}{2} \\ 2\frac{3}{4} \end{array}$ a 3 b $3\frac{3}{4}$ c $4\frac{3}{4}$ d $9\frac{1}{4}$ e not given21 a b c d e

22 Multiply $\begin{array}{r} 3\frac{1}{2} \\ 5 \end{array}$ f $8\frac{1}{2}$ g 15 h $15\frac{1}{2}$ i $16\frac{1}{2}$ j not given22 f g h i j

23 If $z + 3 = 9$, $z =$ a 3 b 6 c 12 d 27 e not given23 a b c d e

24 $\frac{3}{10} \div 1\frac{2}{5} =$ f $\frac{21}{50}$ g $\frac{2}{3}$ h $1\frac{5}{50}$ i $2\frac{1}{10}$ j not given24 f g h i j



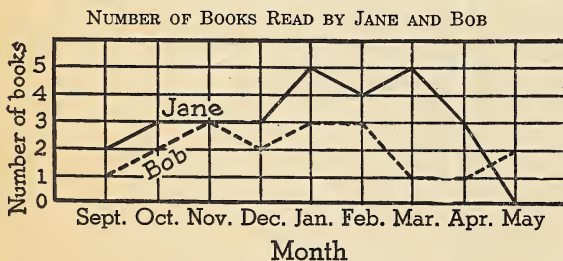
Occupational Distribution

25 What per cent of all workers are included under the heading "All other occupations"? a 40% b 50% c 60% d 320% e not given25 a b c d e

26 What fractional part of the whole group are the professional people and the farmers together? f $\frac{1}{5}$ g $\frac{1}{4}$ h $\frac{5}{18}$ i $\frac{5}{8}$ j not given26 f g h i j

27 Subtract $\begin{array}{r} 12 \text{ years } 5 \text{ months} \\ 9 \text{ years } 8 \text{ months} \end{array}$ a 2 yr. 7 mo. b 2 yr. 9 mo. c 3 yr. 3 mo.
 d 22 yr. 1 mo. e not given27 a b c d e

28 Add $\begin{array}{r} 8 \text{ gal. } 3 \text{ qt. } 1 \text{ pt.} \\ 8 \text{ gal. } 2 \text{ qt. } 1 \text{ pt.} \end{array}$ f 16 gal. 1 qt. 2 pt. g 17 gal. 2 qt.
 h 18 gal. 1 qt. 2 pt. i 19 gal. j not given28 f g h i j



29 How many books did Jane and Bob read during the three months of March, April, and May? a 13 b 11 c 9 d 6 e not given29 a b c d e

30 During the entire school year how many more books did Jane read than Bob? f 4 g 5 h 10 i 11 j not given30 f g h i j

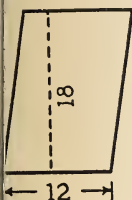
31 Find the average $\begin{array}{r} 17 \text{ oz.} \\ 12 \text{ oz.} \\ 10 \text{ oz.} \end{array}$ a 10 oz. b 12 oz. c 13 oz. d 39 oz. e not given31 a b c d e

TEST 2 *Arithmetic Computation* (Continued)

7

2 $.2 \overline{)10.4}$ $f .052$ $g .52$ $h 5.2$ $i 52$ j not given 32

3 Add $\begin{array}{r} 2 \text{ km. } 769 \text{ m.} \\ 3 \text{ km. } 833 \text{ m.} \end{array}$ a 6 km. 602 m. b 21 km. 2 m. c 21 km. 102 m. d 166 km. 2 m. e not given 33



34 If $A = bh$, what is the area of the parallelogram shown at the left?
 f 30 g 108 h 144 i 216 j not given 34

5 If 50% of an amount is \$1.50, what is the amount?
 a \$.015 b 30¢ c \$3.00 d \$75 e not given 35

6 $\frac{2}{8} = \frac{1}{?}$ f 4 g 9 h 10 i 16 j not given 36

7 If $2y + 30 = 50$, $y =$ a 10 b 20 c 28 d 30 e not given 37

8 Assessed Valuation = \$3000
 Tax Rate per \$100 = \$3.00 f \$33 g \$90 h \$3003 i \$3300
 Amount of Tax = ? j not given 38

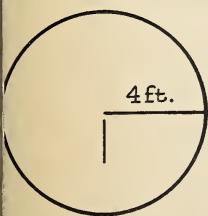
9 $\frac{+18}{-6} =$ a -12 b 3 c 12 d 18 e not given 39

0 Multiply $\frac{-6x}{+2}$ f 12x g -12 h -12x i 12 j not given 40

1 Principal = \$200
 Annual Interest = \$8 a .4% b 2.5% c 4% d 40% e not given 41
 Rate of Interest = ?

2 If $\frac{c}{3} = 12$, $c =$ f 4 g 9 h 15 i 36 j not given 42

3 Principal = \$500
 Rate = 3% a \$1.875 b \$10 c \$15 d \$120 e not given 43
 Time = 8 mo.
 Interest = ?



44 If $A = \pi r^2$, what is the area of the circle shown at the left?
 ($\pi = 3.14$)
 f 16 sq. ft. g 25.12 sq. ft. h 50.24 sq. ft.
 i 200.96 sq. ft. j not given 44

Stop.

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Gr. score	21	28	31	33	35	38	40	43	45	47	49	51	53	55	57	59	61	62	64	66	67	68	69	71	73	74	76	78	79	82	84	87	90	93	97	101	105	108	112	115	119	122	125	129

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